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FM 72-20

WAR DEPARTMENT FIELD MANUAL

JUNGLE WARFARE

WAR DEPARTMENT • 27 OCTOBER 1944

WAR DEPARTMENT,

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FM 72-20, War Department Field Manual, Jungle Warfare, is published for the information and guidance of all concerned.

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For explanation of symbols, see FM 21-6.

CHANNON, R. I.

WAR DEPARTMENT FIELD MANUAL
FM 72-20

*This manual supersedes FM 31-20, 15 December 1941, including C1, 26 May 1942;
C2, 3 August 1942; and C3, 24 September 1942.*

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This manual supersedes FM 31-20, 15 December 1941, including C 1, 26 May 1942; C 2, 3 August 1942; and C 3, 24 September 1942.

Chapter 1

GENERAL

Section I. GENERAL

1. General

In jungle warfare, the soldier often fights two enemies: man and nature. The elimination of nature as an enemy and the use of the jungle itself as an ally are training objectives fully as important as the elimination of the human enemy. The soldier must be trained not to fight the jungle; he must be capable of living successfully in it and making it work for him against the human enemy. The jungle is a strict taskmaster; unless an individual adjusts himself to the conditions imposed by jungle environment, he will be unable to exist long, even if there is no human enemy. It must be remembered that the difficulties imposed by jungle environment are impartially imposed upon enemy as well as friendly troops, and that the unit which better overcomes the difficulties imposed by the environment has a distinct advantage over the opposing force.

Section II. NATURE OF JUNGLE

2. Terrain and vegetation

The term "jungle" is frequently applied to the entire area where jungles predominate, although in many cases they may cover only a portion of the terrain. The jungle itself is that dense tropical growth including underbrush, trees, vines, and giant ferns, found at elevations between the lower foothills or beaches and the high areas above

the timber line. In the areas in which jungle operations are likely to take place, the sequence of growth may be as follows:

a. Shore lines, fringed with almost impenetrable mangrove trees, or open beaches lined with bamboo or coconut groves are typical of the coastal regions of jungle areas. Mangrove trees are characteristic of lowlands, and high tides frequently cover the areas where they are found. The result is what is commonly known as "mangrove swamp," where tidal waters cover mud which is one to four feet deep. The twisting roots, the mud, the sharp coral outcroppings, and the maze of low hanging branches make such areas difficult and dangerous to traverse.

b. Beyond the shore line there may be pineapple, coconut, sugarcane, or rubber plantations, or rice paddies. Some of these extend a considerable distance inland. The low lying foothills between these plantations and the jungle itself are frequently open to the sunlight, and may contain large areas of brush or long grasses 3 to 10 feet high.

c. Next comes the jungle. In some areas, dense jungle extends to the shore line. The undergrowth varies in density according to the amount of sunlight which penetrates the branches of the tree; where it can penetrate, the underbrush is thicker than in jungles where it is excluded. Where the undergrowth is thick, progress (except along the few existing trails) is exceedingly slow and laborious; in many cases a path can be hacked out only with the greatest difficulty, and columns of troops will be in great danger of being attacked in the flanks, or isolated and surrounded. The jungle proper is frequently interrupted by broad grassy savannas or other open spaces; usually these areas are covered with the long grass mentioned above. Water courses, either relatively flush with the adjacent terrain, or following deep, precipitous gorges and gulches, add to the interruptions to progress which the jungle itself presents. In mountainous terrain, streams that are normally shallow may

become raging torrents within an hour after a heavy rain.

d. In some tropical areas, the jungle is broken by higher elevations where growth is sparse and stunted. Above the timber line, wind and unfertile soil limit vegetation to small, hardy, scrub growth.

3. Weather.

In general, jungle weather is hot, humid, and characterized by sudden changes. Within only a few minutes clear, hot weather may change to a torrential downpour. With equal suddenness, the rain may cease and sunshine on the thickly matted vegetation will produce maximum relative humidity. Humidity is constantly high because of the swamps and the shading effect of vegetation. There is a "rainy season" during which monsoons and storms may prevail and rain is considerably more frequent. Seasonal changes in weather are noticeable but not pronounced. The humid heat of the day is often relieved by cool air from the mountains in the late evening.

4. Wild Life

a. Life, particularly plant and insect life, flourishes in this hot, damp environment. The danger from wild animals which roam the jungle is, however, largely a creation of imagination. Animals are fairly abundant in some places and rare in others, but even when abundant, are not commonly seen by man. Most animals have a natural fear of man and their keen senses enable them to keep out of sight. There are relatively few dangerous animals in the islands of the Pacific and in tropical America. Snakes are seldom seen in the jungle, although they may be fairly abundant. Some poisonous snakes may be found in the sea around islands of the East Indies, but like most other snakes will not attack unless annoyed. Experience indicates that most of the poisonous snakes that live on land are likely to be encountered only while clearing ground for a camp. They

present no more of a menace than in temperate climates, but reasonable precautions must be taken. In some regions, crocodiles are a menace and inhabit swamps, lagoons, rivers, and occasionally the salt water areas and beaches near the mouths of streams.

b. The military significance of animal life lies in the fact that rapid movement of animals or birds may provide scouts with evidence of the presence of men. Proper identification of wild plants and animals is of further value to units or individuals cut off from supply lines and depending upon plants and animals for food. However, it is so difficult to come within range of jungle animals that it is best not to rely on hunting as a means of obtaining food; edible fruits, nuts, and plants are more easily obtained. (See app. I and TM 10-420.)

Section III. EFFECT OF JUNGLE ON TROOPS

5. Physical Efficiency

Troops newly arriving in jungle areas experience a climate to which they are not accustomed and are exposed to diseases with which they are not familiar. These conditions impose a special responsibility on all commanders; they must assure themselves that their troops become adjusted to the climate and that the health and combat effectiveness of the command is maintained to the degree necessary to accomplish the assigned missions.

6. Physical Conditioning

The hardships of jungle operations demand physical fitness and acclimation of individuals. The loss of body fluids by perspiration, the increased concentration of the blood plasma and urine, the elevation of body temperature because of physical exertion at high external temperatures, and the effects of the sun all tend to lower the resistance of the body. The outstanding effect of jungle operations on the troops is fatigue. Fatigue can be overcome only by constant physical and tactical training under combat conditions. Physical training produces stamina,

and tactical training preserves stamina by teaching precision and preventing wasted effort. A day and a night in the jungle do not comprise sufficient time to produce the war atmosphere of fatigue. Exercises must be conducted for long periods and over extensive distances. (See par. 23.) Thorough hardening to jungle service is a prerequisite to the effective execution of combat operations.

7. Sanitary Instruction of Troops

Officers and noncommissioned officers must have, and should give their men, a thorough knowledge of the fundamentals of personal hygiene, preventive medicine, and self protection against poisonous plants, noxious insects, and venomous reptiles if they are to maintain the health of their commands in the adverse climate and primitive environment of tropical jungles. Armies have been defeated and campaigns lost as a result of disease.

8. Psychological Effects

As in any area where physical hardship is the rule, there are accompanying psychological reactions to the jungle. These reactions take the form of magnifying the physical hardships and the inherent dangers of warfare. Limited visibility increases the feeling of insecurity, strange noises assume an increased importance, and men tend to become jumpy and panicky. The dull, shaded light and, in many areas at certain periods of the day, the gloomy, drifting mists of jungle areas have a morose and eerie effect which further adds to the feeling of insecurity. Morale is a most important factor in jungle warfare, particularly when troops have experienced reverses. Tactical conditions tend to appear much more adverse than is really the case; our own casualties are exaggerated and rumor is prevalent. It is important that troops be kept informed not only of the local situation, but also of operations elsewhere. Poorly trained troops lose morale very quickly. Thorough prior training is necessary to breed familiarity with jungle conditions, and par-

ticularly to counteract the feeling of loneliness caused by isolation. Only training and experience can overcome these psychological reactions. Again, to learn to live in the jungle and to overcome these imaginary fears to a greater extent than the enemy can, will go far toward successful jungle warfare. As in other so-called adverse conditions of weather, terrain, and climate, these very conditions may, if properly met and exploited, prove a help, rather than a hindrance, to military operations.

9. Morale

a. Maintenance of morale is a command responsibility. To a great extent, however, much depends upon the soldier himself. The jungle can be a place of interest or it can be a prison, depending entirely upon the individual's attitude toward it.

b. Military life in the tropics is made up of two extremes: periods of intense activity and periods of almost complete inactivity. The necessary work during some periods is so great that it seems impossible ever to finish; time passes rapidly and there is little opportunity to think of anything but the job on hand. These periods are followed by other periods when every effort to push the job forward will be blocked; despite the best efforts to carry on the work it will be necessary to wait for something or somebody; there is nothing to do but sit and wait. During the period of intense activity everyone will be content. There need be no worries about morale at this time. It is during the periods of inactivity that special attention must be given to the small things that mean much to soldiers. Such matters as mail, exercise, variation in diet, and recreation are of particular importance. The situation may be such that leaders can do relatively little about such things, however, they should exhaust every means to do what is possible. The fact that the men know that their leaders have made an extra effort to look after their comfort and welfare will mean much in relieving a monotonous period.

c. Factors which promote contentment in the tropics

are good health, and sufficient work, rest, and recreation. Rules for care of the soldier's health must be strictly adhered to, not only because it is the duty of a soldier to try to maintain his health so that he can efficiently perform his duties, but for his own good and peace of mind as well. No man can do his best when not feeling well.

d. The soldier must keep busy to be content. When his military duties are completed for the day, he still should keep busy. Idleness becomes an insidious habit in the tropics and eventually works upon a man's mental make-up. Even though he has been doing hard physical work, the soldier will find that participation in a not too strenuous competitive game is a relaxation. He must take every opportunity to enter into such forms of recreation. This is the sort of thing that prevents him from going "stale" on a jungle assignment. In addition, the soldier should attempt to practice his hobbies or cultivate new ones. If he is of the type who enjoys the outdoors, he will find plenty to do—hunting, fishing, and trapping. He might also make a hobby of the jungle itself by learning something about the birds, plants, insects, or even the inhabitants. Learning the local language may prove interesting. Commanders should cultivate the friendship of the natives. Friendly natives add to security, can teach jungle lore, and can add immeasurably to the amusement of soldiers by inviting them to tribal celebrations and ceremonies. The necessary precautions against malaria and other diseases must, however, always be borne in mind. Movies and radio programs can be made available to units not in close contact with the enemy, and their use as morale builders is highly desirable.

Section IV. EFFECT OF JUNGLE ON OPERATIONS

10. General

Tactical operations in jungle terrain do not vary in principle from those under any other conditions. There are, however, certain differences in their application re-

sulting from the conditions peculiar to jungles. For a discussion of tactical principles and their general application, see FM 100-5 and the appropriate Field Manuals of the various arms and services.

a. Movement in the jungle is often calculated in terms of time, rather than distance, the problem being *how long* it will take to get from one place to another, rather than *how many miles* it is between those places. Because of the poor quality of trails, their insufficient number, or their complete absence, and the difficulties of the terrain, the movement of troops is slow. Generally there can be no movement of tracked or wheeled vehicles larger than the $\frac{1}{4}$ -ton truck until engineers have improved the tracks and trails.

b. Flank security elements cannot maintain a fixed rate of march when operating off trails in thick jungle; their rate of movement, and consequently that of the column, is slowed by the necessity for cutting a trail; and the noise of their cutting may warn the enemy of their approach. Flank security of a jungle column is usually maintained by sending small detachments out a short distance on each side of the trail to listen and search for the enemy. These detachments withdraw and rejoin the tail of the column as it passes.

c. Supporting weapons and ammunition cannot be moved over jungle trails at the same speed as that at which ground troops move. If artillery is required to move over trails to support jungle operations, the speed of troop movement must conform to the speed at which artillery can displace.

d. Primary means of supply may be by air drop, carrying parties, pack animal, boat, or canoe. All have been used with success, but each has its limitations.

11. Observation

The dense foliage greatly restricts all observation. In many cases visibility is limited to as little as 20 feet. This makes contact and control one of the most difficult problems of jungle warfare, and considerably increases

the responsibilities of small-unit leaders. Limited observation necessitates narrow frontages, reduced distances and intervals between units, and increased patrol activity and use of liaison parties. It increases the opportunities for ambush and the achievement of surprise small-arms fire. The difficulties of observation greatly restrict the use of supporting units and weapons. (See par. 51.) Indirect fires frequently must be adjusted by means other than direct observation of burst. The limitations of observation may be partially overcome by means of greater use of observation posts and increased communication facilities.

12. Transport

Vehicle operation for the most part is restricted to coastal regions and around plantations where adequate roads and wider trails are available. Pack animals may be used, but they require care and necessitate food for their own subsistence. Trails suitable for pack animals frequently are also suitable for operation of 1/4-ton trucks. However, hand-carry is the principal means of transport. Native carriers are used for this purpose when available, but are subject to the limitations discussed in section IV, chapter 3.

13. Communication

All organic means of communication are employed where appropriate. Telephones have proved very serviceable; even patrols sometimes lay wire. The usefulness of radio is reduced by the screening effect of foliage and ground masks. Visual signaling is limited by the vegetation and the overhead canopy of trees, but smoke, lights, and pyrotechnics may be used by careful planning. Prearranged sound signals are important to security detachments. Foot messengers remain the major means of communication; these must be men of stamina and resourcefulness, who can work their way with assurance through the wilderness or along troop columns on narrow

trails, and deliver their messages. Subordinate leaders must assure a constant flow of combat information from front to rear.

14. Fields of Fire

Because of the undergrowth and rugged terrain, good fields of fire are seldom obtained. Ideal firing positions are almost never to be found. Machine guns and automatic rifles seldom have fields of fire extending more than 100 yards; about 50 yards may be considered the average. Fields of fire for individual riflemen are even more restricted.

15. Concealment

The jungle provides ideal concealment for both offensive operations and for defensive positions. For this reason, surprise is always possible. The undergrowth and the dim light favor stealthy movement of attacking forces to assault positions. Similarly, exact "fixing" of enemy defensive positions is most difficult.

Chapter 2

HEALTH, HYGIENE, AND SANITATION

16. Diseases in General

a. Troops arriving in jungle areas are exposed to many diseases with which they are not familiar. The level of sanitation in jungle areas and among the native inhabitants is frequently very low. Furthermore, there is often great difficulty in enforcing even the simplest sanitary regulations, as many natives are too ignorant, superstitious, and lazy to cooperate. Water supplies are grossly contaminated, and there are no modern water supply systems. Rain-water catchments are used in some areas. Most natives use shallow, poorly protected wells, or drink from streams. There are no sewerage systems and natives are unwilling to use latrines. Animals and some natives dispose of body waste promiscuously, even directly into the streams used for drinking water.

b. Mosquitoes capable of transmitting malaria, elephantiasis (filariasis), break-bone fever (dengue fever), and yellow fever are found in large numbers. Flies are abundant and are important mechanical carriers of intestinal diseases and yaws. Mites are numerous, and lice and fleas are found. Blood-sucking leeches are extremely common. Chiggers may be carriers of "scrub typhus" (see par. 17f) and in areas where they occur, are always at least a severe nuisance. Other pests are ants, centipedes, cockroaches, scorpions, and rats. Poisonous snakes and crocodiles are the principal dangerous animals present.

c. Diseases of greatest military importance are malaria, elephantiasis (filariasis), intestinal diseases, venereal diseases, break-bone (dengue) fever, and typhus fever. Of these, malaria is the most important and is wide-

spread in all seasons. The common diarrhea and amoebic and bacillary dysentery are the most frequent intestinal diseases, but typhoid and paratyphoid fever also occur. Gonorrhea is the commonest form of venereal disease, but syphilis and granuloma inguinale are also widely found. Fungus infections are frequent, as are other skin diseases. Tropical ulcers are particularly common. Parasitic infections, heat exhaustion, sunstroke, and pneumonia may affect small numbers of troops.

17. Insect- and Animal-Borne Diseases

Insect- and animal-borne diseases are those in which the agent which causes the disease is transmitted from man to man, or from animal to man, by a bloodsucking insect or animal. The germ may be introduced into the blood stream or tissues of man during the bite of the infected insect, or it may be deposited upon the skin by the infected insect during the process of biting. In the latter instance, the irritation resulting from the insect bite causes scratching and infection of the wound with the germ. It is necessary for troops to exercise every precautionary and preventive measure described below in order to avoid infection. The carriers of these diseases are—

a. MOSQUITOES. (1) *Diseases transmitted.* Malaria, yellow fever, break-bone (dengue) fever, elephantiasis (filariasis), and some forms of sleeping sickness are mosquito-borne.

(2) *Description.* The three kinds of mosquitoes which transmit disease are the Anopheles, Aedes, and Culex.

(a) The Anopheles group contains a number of species which transmit malaria. They bite during the night, at dusk, and at dawn. They may also bite, when disturbed during daylight hours, in shady, relatively cool, humid areas. They do not sing while flying. The adults have characteristic wing markings, long feelers, and, except for a very few species, rest and bite with

the body at an angle of about 45° to the surface. (See fig. 1 ①.) Many species hold the hind legs in the air while biting.

(b) The *Aedes* group transmit yellow fever, dengue fever, elephantiasis, and a form of sleeping sickness. They bite during the day, but may also bite at night. The adults are characteristically marked with silver, white, or yellow bands and lines. They rest and bite with the body parallel to the surface. (See fig. 1 ②.)

(c) The *Culex* mosquito transmits elephantiasis and a form of sleeping sickness. Many species of this type, even though nondisease-transmitting, are biting pests. They bite at night, at dusk, and at dawn. The adults

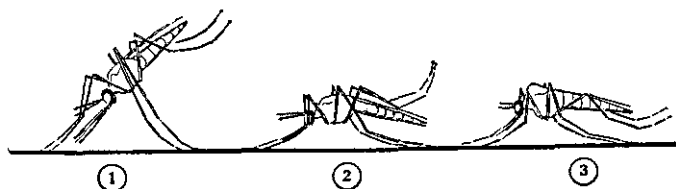


Figure 1. Disease-transmitting mosquitoes.

① *Anopheles*. ② *Aedes*. ③ *Culex*.

have no stripes on the chest or abdomen and, with few exceptions, rest and bite with the body parallel to the surface. (See fig. 1 ③.)

(3) *Preventive measures*. (a) Any collection of water which persists for longer than one week may serve as their breeding place. (See FM 8-40.) The species vary in their preferences for types and locations of breeding places. Most species prefer fresh, slow-moving waters; some prefer brackish water; while others breed in gutters, cisterns, rain barrels, broken coconut shells, tin cans, ruts, and rot holes in trees. Certain species prefer to breed in water containing organic material. The preference of the different species for sunlight varies greatly.

(b) Any mosquito-control measures used by moving

troops will be governed by the military situation. Concealment against observation from the air is of prime military importance, and the clearing of vegetation therefore cannot be practiced except in limited areas. Under such circumstances, control of mosquito-borne diseases will be based upon the protection of men from the bites of mosquitoes and the use of drugs to suppress the effects of infection. A vaccine is used against yellow fever.

(c) Headnets and gloves should be provided for all personnel. These items of protective clothing are particularly valuable for personnel on outpost or similar duty, and during darkness when personnel are on duty which precludes the use of mosquito bars. Mosquito bars must be used by all personnel when sleeping out of doors or in shelters not fully protected by screening. Insect repellent will be employed not only on the exposed skin, but also on taut clothing. Insecticide spray or aerosol will be used. It is important that clothing be worn completely buttoned with sleeves rolled down, and that it be free of tears and rents that expose the skin.

(d) Unless in the execution of some military duty, personnel will avoid natives and native villages, particularly after sundown. Natives will not be permitted to sleep in camp, and preferably will be kept at least one mile from camp. (One mile is the approximate maximum flight range of mosquitoes.)

(e) Commanding officers are responsible for the execution of mosquito-control measures. Their decisions are based upon the military situation and the recommendations of Medical Department officers upon completion of mosquito surveys. For a detailed discussion of mosquitoes and mosquito control, see FM 21-10.

b. Ticks. (1) *Diseases transmitted.* (a) Hard ticks transmit Rocky Mountain spotted fever, other kinds of tick bite fevers (tick typhus), rabbit fever (tularemia), and tick paralysis.

(b) Soft ticks transmit famine fever (endemic relapsing fever).

(2) *Description.* Ticks as a class may be identified by the flat, oval body, small head and chest, and comparatively large abdomen. The legs are short and jointed, all being approximately the same size. The larvae or seed ticks have six legs; the nymphs and adults eight legs. Hard ticks ordinarily do not attach themselves at once after gaining access to the body of man.

(3) *Preventive measures.* (a) Frequent inspection of exposed skin areas and prompt removal of free ticks, and complete body inspection each morning and night when the military situation permits, with careful removal of free or attached ticks, will aid in the prevention of infection. Ticks should never be smashed or squashed on the skin. When sudden force is used to remove a tick, the biting parts often are left in the skin, and will produce infection. It is not possible to remove a tick by unscrewing it. Recommended methods of removal are: grasping the tick firmly and tenting the skin with gentle traction; killing the tick with gasoline or kerosene; closing the breathing pores with vaseline or an oil; or applying a lighted cigarette. Tincture of iodine should be promptly applied after removal of the tick.

(b) Huts, storehouses, native shops, and other structures in tick-infested areas should be avoided. Abandoned huts, storehouses, barns, and corrals should be burned. Native domestic animals and pets should be avoided as tick carriers.

c. SAND FLIES. (PHLEBOTOMUS FLIES). (1) *Diseases transmitted.* Sand-fly fever, 3-day fever (Pappataci fever); Oriental sore, Delhi boil, tropical sores and certain other sores and fevers are sand-fly borne.

(2) *Description.* Sand flies are hairy two-winged insects having long legs; these insects are so small as to pass through ordinary mosquito netting. They are delicate, apparently disintegrating into gray dust when hit, but are vicious biters. Gloves, special headnets, and repellents furnish some protection against sand flies, and the insecticide aerosol or spray will kill them. They do not fly high, and, since their flight range is not over 100

yards, can be avoided by proper location of camp sites.

d. FLEAS. (1) *Diseases transmitted.* The rat flea is a carrier of Black death (bubonic plague) and Brill's disease (endemic typhus). Fleas of other rodents may also transmit these diseases.

(2) *Description.* Fleas are small, wingless, brown or black insects with a laterally compressed body, small head and chest, large abdomen, and large powerful legs. The first pair of legs appear to be attached to the base of the head. The female is larger than the male flea.

(3) *Preventive measures.* Since rats are the usual hosts of the flea, the elimination of these rodents is the best preventive measure. Food should be stored so that rats cannot get at it, and all garbage should be burned. In camps occupied for any length of time, trapping and poisoning should be practiced as soon as rats appear. See FM 21-10 for methods used in trapping. Rats (and their fleas) are usually in huts, storehouses, and native shops, and especially on animal pets in these places. Abandoned huts and storehouses should be burned.

e. BODY LICE. (1) *Diseases transmitted.* The body louse and head louse may transmit jail fever (epidemic typhus fever), famine fever (relapsing fever), and 5-day fever (trench fever).

(2) *Description.* Lice are small, gray, flattened, six-legged, wingless insects, with claws on the terminal joint of each leg.

(3) *Preventive measures.* A man can be infected by the feces of lice rubbed into the skin by the person scratching, and by the body juices of a crushed louse. To keep from getting lice, one should avoid close contact with individuals likely to be infested, their clothing and bedding, and should stay out of native huts, bazaars and cantinas. Frequent bathing and washing of clothing is discouraging to lice, and the army louse insecticide powder will kill them. This powder should be applied with special attention to the seams of clothing.

f. MITES. (1) *Diseases transmitted.* Free-living mites are widely distributed throughout the world. The adult

eight-legged mite does not attack man. The six-legged mite larva attacks man and other animals, some of which serve as a reservoir for "scrub typhus." In the United States and Europe, the variety known as chiggers (red bugs) produce considerable skin irritation which may become secondarily infected from scratching. In the Far East, the Kedani mites transmit "scrub typhus" fever (Japanese river fever, tsutsugamushi fever).

(2) *Description.* The six-legged mite larva is a minute, hairy insect less than $\frac{1}{25}$ th inch in length.

(3) *Preventive measures.* Clearing and burning of grass and scrub about a camp reduces the number of mites. Sleeping on the ground should be avoided if possible. If exposed, troops should bathe with thorough soaping and scrubbing. Clothing can be impregnated with the standard quartermaster insect repellent by using a hand spray, with particular attention to such openings as the collar, shirt front, waist, socks, and trouser legs. If quartermaster insect repellent is not available, flowers of sulfur can be applied to the skin and clothing or taken internally.

g. BLOODSUCKING FLIES. (1) *Diseases transmitted.* Flies of the genus chrysops transmit rabbit fever (tularemia); the western deer-fly transmits deer fly fever; and mango flies and fruit flies transmit the filarial African eye worm (loa-loa). Black flies and buffalo gnats transmit a filarial worm (*Onchocerca volvulus*) causing blinding filarial disease.

(2) *Preventive measures.* Mosquito nets, protective clothing, quartermaster insect repellent, and insecticide aerosol should be used.

h. TRIATOMIDAE (CONE-NOSE BUGS, ASSASSIN OR KISSING BUGS). (1) *Diseases transmitted.* Cone-nose bugs may transmit American Trypanosomiasis (Chagas disease).

(2) *Description.* They are large-sized, dark brown or black bugs, having a narrow, cone-shaped head, a long, oval-shaped abdomen, long legs, well-developed wings, and regularly arranged markings on the forward part of

the chest, wings, and borders of the abdomen. They are common to tropical America, where they are called "barbero" (because they frequently bite about the face) and also "chincas voladoras" or flying bedbugs.

(3) *Preventive measures.* To avoid these, keep out of huts, native shops, stables, barns, or chicken houses; burn abandoned huts or barns. Do not sleep on the ground. For individual protection, use mosquito nets and protective clothing. At semipermanent camps or stations, buildings should be screened.

i. **VAMPIRE BATS.** (1) *Diseases transmitted.* Vampire bats on the island of Trinidad transmit rabies (hydrophobia) to human beings and animals. The virus of rabies is carried in the saliva of the infected bat.

(2) *Preventive measures.* Antirabic treatment must be administered to persons bitten by this species of bat. Immediate first-aid treatment consists of cauterization of the bite wound with trichlor acetic acid or nitric acid. After cauterization, the wound is treated by the application of sterile tannic acid ointment and a tight compression bandage.

18. Water-Borne Diseases

a. **DISEASES.** Typhoid fever, the paratyphoid fevers, bacillary (bacterial) dysentery, amoebic dysentery, and cholera may be disseminated by contaminated drinking water. Infections from this source are prevented by drinking treated or purified water only (see also par. 19).

b. **PREVENTIVE MEASURES.** (1) The water selected for human consumption should come from as clean a source as possible. When water is obtained from a stream, the water point for men should be above that for animals, the bathing point, the laundry point, vehicle washing point, and fords. On lakes, the intake point for drinking water should be so placed that wind and water currents flow away from the intake point and toward water points for other uses. The heavier organic or inorganic matter should be removed by filtering, straining,

or settling. An infiltration basin may be constructed by digging a pit 6 or 8 feet from the edge of the stream or lake and 5 to 6 feet below the main water level.

(2) Except at high altitudes, boiling for five minutes renders water safe for human consumption. For large groups this method is unsatisfactory because of the time, fuel, and containers required.

(3) Chemical purification of water may be accomplished as follows:

(a) *Calcium hypochlorite ampules.* Use one ampule per canteen of water to make a purification solution. One canteen capful of this solution is sufficient to purify one canteen of water. Water thus purified should not be drunk until $\frac{1}{2}$ -hour after the purification solution is introduced.

(b) *Halazone tablets.* Use two $\frac{1}{16}$ -grain, or one $\frac{1}{8}$ -grain, tablets per canteen of water. If water is very cloudy, double the amount of halazone used. Shake to dissolve the tablets, and wait one-half hour before drinking.

(4) Chlorination is a better method and may be accomplished for the entire command by mobile purification units operated by the Corps of Engineers, or by organizations using water carts, small reservoirs, or the water-sterilizing bag (Lyster bag). For a discussion of the various suitable means of purifying water, see FM 21-10.

19. Intestinal Infections

a. DISEASES. The principal diseases in this group which occur in the tropics are amoebic dysentery, bacillary (bacterial) dysentery, cholera, food infection, food intoxication, worms (helminthic infections), paratyphoid fevers, protozoal dysenteries, typhoid fever, and undulant fever (Malta Fever). These diseases are usually transmitted by the eating or drinking of contaminated food or water. Contamination of food is common. The contamination may be caused in vegetable products by

contact with infected material during growth, such as human excreta used as a fertilizer. Contamination of any food may be caused by dirty utensils or by food handlers who have, or are carriers of, intestinal diseases. Native fruits and vegetables which cannot be peeled or cooked should not be eaten.

b. PREVENTIVE MEASURES. (1) In the jungle, all perishables, both meats and vegetables, which cannot be stored in a refrigerator below 40° F., should be cooked immediately upon receipt, except that frozen meat should be cooked immediately after thawing. All nonperishable food should be stored in vermin-free boxes or chests. All food should be kept as free of dust as possible, and every effort made to prevent contamination during transit.

(2) All foods should be served immediately after preparation. No left-overs should be served. Hard bread, canned meat, and other canned foods should be issued to troops in position unless hot food can be brought up in original containers. Because of the possibility of both contamination and the growth of an infectious agent prior to the time they are eaten, sandwiches or other prepared luncheons should not be issued for later consumption.

20. Special Tropical Diseases

Yaws (Frambesia), Tropical Bubo (lymphogranuloma inguinale), and granuloma inguinale are diseases which may be transmitted through sexual intercourse. The lesions of yaws are similar to those of syphilis. Tropical Bubo is a virus disease. The initial lesion is so small that it usually passes unnoticed. Later the lymph glands in the groin become enlarged, break down, and ulcerate. Granuloma inguinale is usually limited to the genitalia and inguinal region, but may spread to other parts of the body. The lesions consist of large ulcerating areas which spread, gradually destroying the tissues as they advance.

21. Fungus Diseases of Skin and Hair

a. DISEASES. Ringdorm (tinea); dhobie itch (epidermophytosis of the groin and body); athlete's foot (epidermophytosis of the feet); pinta, a fungus disease of the skin, characterized by pigmented patches; and trichosporosis, a fungus disease of the hair, are the principal fungus diseases. The seriousness of these diseases, especially those of the feet, is seldom realized except by men with long jungle experience. These diseases are especially serious in the jungle due to the fact that—

(1) The climate favors the growth of the tough plants called fungi which produce these diseases.

(2) The native inhabitants, their houses and premises are usually contaminated by harmful fungi.

(3) More individual effort is required to keep the body and clothes clean due to difficulty in supplying jungle troops.

(4) The extreme fatigue resulting from jungle marching is apt to cause soldiers to neglect to wash their clothes and bodies even though they have been told that their health depends on cleanliness.

(5) Some men lacking jungle experience falsely believe they are tough enough to stay healthy in the tropics and need not take the precautions prescribed.

b. PREVENTIVE MEASURES. To prevent fungus diseases of the skin and hair is much easier than to cure them. The following preventive measures are important:

(1) Keep as clean as possible, and wash as often as is practicable. Use plenty of soap and water, when available, both for bathing and washing clothes. Socks should be washed with soap at least once a day. If a stream cannot be reached after making camp, use a part of the water in the canteen and a little soap to wash at least the armpits, groin, and feet. Do not use a towel in the jungle.

(2) Do not go barefooted in the jungle.

(3) As far as possible avoid soiling clothes. Avoid mud. Use the machete to provide a clean place to rest

during halts. Unnecessary dirtiness is a sign of stupidity, not toughness.

(4) Keep the skin dry, well ventilated, and free from tight clothing. Wear only enough clothing to afford protection from insects and thorns. Avoid wearing underclothes unless forced to do so by the rubbing of the outer clothing. Wear clothing and shoes which will allow air to reach the skin.

(5) Sleep with as little clothing as the temperature permits. Never sleep in wet, dirty clothing.

(6) Sleep off the ground, preferably in a hammock or on a platform.

(7) Clean under and around the nails of the hands and feet.

(8) Take sunbaths for short periods whenever practicable. Be sure that exposure is increased gradually and the skin is not burned.

(9) Stay away from native houses. Live and camp in clean uninhabited jungle.

(10) Dust socks and insides of shoes with foot powder.

(11) Wash and sun articles, such as packboards, used by more than one man.

(12) Officers should hold frequent foot inspections.

C. INDIVIDUAL JUNGLE TREATMENT OF FUNGUS SKIN INFECTIONS. (1) During prolonged jungle operations, each individual soldier must take care of his skin and make every possible effort to keep infected skin areas as clean, dry, well-ventilated and protected as possible. Soap and water help cure, as well as prevent fungus infections.

(2) After washing and just before retiring, treat infected skin areas with antifungus medicine or half-strength iodine. Do not scratch insect bites; treat as above. Iodine should not be applied before exercising or exposure to sunlight. Although painful, washing the infected skin areas with undiluted alcohol is advisable in rashes around the crotch and under the arms. The army

foot powder helps both foot and body rashes of the milder types.

(3) In general, avoid bandages and greasy medicines. Dry up fungus infections with drying medicines in conjunction with air and sunlight.

(4) Clean off dead, infected skin. Do not scratch.

(5) Boil clothing, especially socks, daily. Do not wear one sock first on an infected foot and then on a healthy foot. Dry, stretch, and soften socks before replacing in field kit.

(6) Avoid overtreating. Follow instructions. Do not use too much medicine or apply it too often.

(7) Consider all skin diseases as serious. Treat them regularly, intelligently and patiently.

d. REMEDIAL ACTION. Fungus diseases, if neglected, will incapacitate many individuals, regardless of personal cleanliness and the use of foot powder. At the first symptoms of a fungus infection, prompt use should be made of the prescribed medicine carried in the individual or group first-aid kits. In the event of excessive inflammation or itching, a medical officer should be consulted as soon as possible.

22. Venomous Snakes and Snake-Bite Treatment

a. VENOMOUS SNAKES. (1) Snakes, both poisonous and nonpoisonous, may be expected in jungle areas wherever there are many small rodents, frogs, or other animals which are food for snakes. Although most of the Pacific islands are completely free of snakes, a check should be made with island natives or evacuating troops to ascertain whether snakes are to be found in occupied areas. Snakes exist on all tropical mainlands.

(2) *Precautions to observe.* The most important single fact to remember about snakes is that *more people are bitten while trying to catch or kill snakes than in any other way.* There is no dependable rule by which a venomous snake can be distinguished from a harmless one at any considerable distance. *If a snake is found,*

he should be treated with the same intelligent precaution as a high explosive "dud"; he should be left alone. In general, the most effective snake repellent is cleanliness. Open garbage pits, carelessly discarded ration containers, or other evidences of carelessness which provide food for rats, mice, or other vermin also attract snakes which eat these small animals. Strict police of occupied areas will discourage snakes, as well as other noxious pests. Some units, encamped for extended periods, have found that keeping a few pigs in the area is an effective measure against snakes. Pigs are not usually affected by the bites of snakes, and will hunt them down, kill them and eat them.

b. SNAKE BITE. (1) The bite of a poisonous snake will be accompanied by a sharp, burning pain which will spread rapidly. Upon examination, the wound will show one or two deep scratches or punctures where the fangs have pierced the skin. These wounds usually will not bleed profusely, but will be very painful. The snake should be killed, if possible, and shown to a medical officer, since the type of antivenom used will depend on the kind of snake involved. Even if the snake should be found to be nonpoisonous, the bite should be treated medically, because the wound is multiple and dirty, and very conducive to severe infection.

(2) Having killed the snake, it may be identified generally as follows: Poisonous snakes have:

- (a) Elliptical pupils in their eyes—like those of a cat.
- (b) Large bodies and diamond or spade-shaped heads.
- (c) A single row of belly plates behind the vent.
- (d) Prominent forward teeth or fangs, usually curved to the rear. *Not all* poisonous snakes conform to this description; *the above points serve only as a general guide.* If the bite is accompanied by a sharp pain, the snake is poisonous.

(3) If the snake is poisonous, the sooner first aid is applied to the victim, the better. Do not run for help, nor waste time searching for proper implements.

(a) If no snake-bite kit is available, proceed promptly as follows, using whatever materials are at hand: Sit down. Apply a tourniquet *between the bite and the heart*, above the knee, in foot and leg bites; above the elbow, in hand and arm bites. Rope, belt, necktie, undershirt, a shirt sleeve, or communications wire may be used as field expedient tourniquets. Using a knife, razor, or other sharp article, make crisscross incisions across the fang marks and on any swollen or discolored areas. These incisions should be about $\frac{1}{2}$ inch across and as deep as the fangs are believed to have penetrated. Twist the tourniquet so that only a slight flow of blood comes from the wound—and start suction on the incisions. If there are open sores or bad teeth in the mouth, cause the wounds to bleed as much as possible with the hand, using a “milking” or squeezing motion away from the heart. If the inside of the mouth is intact, it is safe to suck the blood and poison out of the wounds and spit it out. *After applying first aid*, ride, if possible, or walk slowly to an aid station for medical treatment. The tourniquet should be *kept tight for about 20 to 30 minutes*, then *loosened for 10 to 15 seconds*, then tightened again. Remember to take the dead snake to the aid station for identification.

(b) The snake-bite suction kit consists of a tourniquet, a rubber bulb, two metal suction applicators, and a razor blade. The tourniquet and razor blade are to be used as outlined in (a) above. The metal applicator is inserted in the suction bulb, air is squeezed out of the bulb, and the metal applicator is applied to one of the crisscross incisions. The bulb is permitted to fill with blood, venom, and air; is emptied and applied to other crisscross incisions, if any. This process is continued. Venom can be extracted from the tissues as late as three to five hours after the bite. Multiple crisscross incisions should be made over the swollen area, especially at the advancing edge of the swelling, and suction applied. After applying first aid as outlined herein, move the patient to an aid station for medical treatment.

(c) Do not attempt "home remedies" such as drinking alcohol, cauterization, eating the snake, or using potassium permanganate—they do not work, and are very dangerous. Suction and antivenom injection are the best treatment, and the sooner they are applied, the quicker will be the recovery.

Note. Some people are allergic to certain types of antivenom. In some cases, the sensitivity of the victim to the antivenom may cause a more dangerous condition than the original snake-bite. Sensitivity tests should be made on all snake-bite victims before injection of antivenom.

Chapter 3

JUNGLE SERVICE

Section I. TRAINING FOR JUNGLE SERVICE

23. Physical Conditioning

a. During training for jungle operations, continuous emphasis must be placed on physical conditioning. Officers and men must follow a strict program designed to increase stamina. In the final periods of training all work should be in the field. Difficult tactical marches constitute good conditioning exercises. Tactical exercises should be conducted over the most difficult terrain available. Swimming is one of the best all-around exercises; jungle training areas frequently include swimming facilities. Obstacle courses of the ordinary type provide another excellent means of conditioning.

b. ACCLIMATIZATION. (1) Prior to entering a jungle combat area, troops from temperate zones should undergo a special period of training, gradually increasing in hardship, in a jungle area of similar climate and terrain to that in which they are to fight. This training period is required regardless of the physical condition of the troops, although good physical condition will permit considerable shortening of the period. For seasoned troops, a period of four weeks should suffice. Longer periods result in staleness and a decrease in efficiency. The general health, and hence the effectiveness of a command subject to strenuous exertion and poor living conditions in the tropics, degenerates progressively with the passage of time. Ideally, therefore, the period of training should be conducted in a tropical or subtropical area thoroughly controlled by friendly troops; movement to the combat zone should be planned to permit arrival

of the troops only early enough before being committed to action to allow a brief tune-up following the period of inactivity during travel; one week should be sufficient time for this tune-up.

(2) When work is begun at the time of first exposure to the heat and progressively increased with the limits of tolerance of the man, full acclimatization (the ability to perform a maximum amount of strenuous work in the heat) is attained most quickly. A schedule, with alternating rest and work periods of one-half hour, and which provides for work during the cooler morning hours and in the hot afternoon hours, should be set up according to the following plan:

Proposed Schedule of Work During Period of Acclimatization:

When maximum air temp. is 90° to 105° F.	Hours of work	When maximum air temp. is 105° F. and over
First day.....	0700-0900 and 1500-1700	0700-0900 and 1500-1600
Second day.....	0700-1000 and 1430-1630	0700-1000 and 1500-1600
Third day.....	0700-1000 and 1400-1700	0700-1000 and 1400-1600
Fourth day.....	0700-1100 and 1330-1750	0700-1000 and 1330-1630
Fifth day.....	Regular duty	0700-1100 and 1330-1630
Sixth day.....	Regular duty	Regular duty

(3) Once acclimatized, the soldier will retain his adaptation for from one to two weeks after he leaves the hot environment. If not reexposed to high temperatures, the acclimatization will then decrease at a variable rate. Most men lose the major portion of their acclimatization in one month.

(4) The well-acclimatized man deprived of adequate rest at night is incapable of producing his customary amount of work in the heat on the ensuing day, or does so less efficiently.

(5) Officers who know the work capacities of their men can determine their degree of acclimatization and whether or not it is safe for them to continue activity.

The acclimatized man is alert, performs his work energetically and without symptoms. In contrast, the unacclimatized man working in the heat becomes dull and apathetic, performs his work poorly, and may manifest to varying degrees, either singly or in combination, the symptoms and signs of heat exhaustion.

c. WATER REQUIREMENTS. (1) In the jungle, where the humidity is high, sweat does not evaporate but runs off the skin; therefore, cooling is less efficient and water losses may be greater.

(2) At high temperatures a resting man may lose as much as a pint of water per hour during the day by sweating; if he works, his water loss (and requirement) will increase in direct proportion to the amount of work done. Hardworking personnel, such as engineers, marching men, and members of labor battalions, may require as much as 3 gallons of water per man per day. Any restriction of water below the levels necessary for the men will result in rapid loss of efficiency, reduction in ability to work, and deterioration in morale. If restriction is continued for hours, temperatures will rise and heat exhaustion occur. There is no advantage in using thirst quenchers such as chewing gum, fruit drops, etc. For a given amount of work under high temperature conditions, it has been found that water consumption is substantially the same whether water is taken only at meal times or taken when thirsty. The greatest benefit will be obtained and maximum efficiency result if water is taken at short rather than at long intervals. Drinking in small amounts when thirsty is the ideal practice.

d. SALT REQUIREMENTS. In all circumstances, the loss of a large volume of water through sweat is associated with a loss of salt. The amounts of salt taken in the normal diet are adequate to supply and make up for the losses when the total water intake is under 1 gallon per day. Above these levels, added salt is needed. It is best taken in solution in the drinking water. It is particularly necessary that salt be taken in the first few days of exposure to heat, since the losses of salt then are

greater than after acclimatization. Water containing the proper amount of salt can be prepared as follows:

(1) One pound table salt to 100 gallons of water.

(2) 0.3 of a pound table salt to the Lyster bag (36 gallons).

(3) One-fourth teaspoonful table salt to each canteen of water.

(4) Two 10-grain salt tablets dissolved in every quart of water consumed. The consumption of undissolved salt tablets is not recommended.

e. HEAT STROKE, HEAT EXHAUSTION AND HEAT CRAMPS. (1) *General.* Troops training or operating in hot climates may experience one or more of the ill effects of exposure to high temperatures. This is more likely to occur if there is also a high humidity. There are three well-defined conditions which should be understood by all line officers and enlisted men. These are: (a) heat stroke, (b) heat exhaustion, (c) heat cramps. The cause and methods of preventing these are similar. However, the three conditions produce distinctive signs and symptoms which everyone should be able to recognize at once in order to give proper care and attention to the victim.

(2) *Heat Stroke.* (a) *General.* This condition often appears suddenly. There is headache, dizziness, often with nausea and vomiting, and then collapse, delirium and unconsciousness. The first sign may be that of collapse. The important thing to remember is that *the skin is hot and dry*. This is due to the fact that in heat stroke the temperature goes very high (106° F. or higher).

(b) *Emergency treatment.* *The one thing that will save the victim's life is to lower his temperature quickly.* In the field do not wait for medical treatment or an ambulance, but immediately remove the patient's clothes except for the shorts, and whenever possible sprinkle his entire body with water. Have some attendants briskly rub the arms, and legs, and trunk to increase blood circulation to the skin and others fan him continually to in-

crease the speed of water evaporation and its consequent cooling effect. Medical attention should be secured as soon as possible, as the patient will have to be hospitalized. However, measures to cool the body must be continued during the transfer of the patient to the hospital.

(3) *Heat exhaustion.* (a) *General.* This condition is manifested by headache, drowsiness, extreme weakness, dizziness and inability to walk. There may be some muscle cramps. The important thing to remember is that *in heat exhaustion the skin is moist, cold, and clammy.* While this condition is frequently incapacitating, the death rate is low.

(b) *Emergency treatment.* Removal of the individual to a cool place where he may rest and receive large quantities of salt water will usually bring about recovery. However, no chances must be taken, and medical attention must be secured or the patient hospitalized.

(4) *Heat cramps.* (a) *General.* Heat cramps are manifested by painful spasms of the muscles, more frequently of the legs, arms, and the abdominal wall. Their severity varies from mild and annoying to severe and completely disabling.

(b) *Emergency treatment.* These symptoms are directly due to lack of salt in the body. They are relieved when this salt loss is replaced. Treatment consists of drinking salt water freely. Severe cases must be hospitalized as it will probably be necessary to give the salt solution intravenously.

24. Mental and Psychological Training

The psychological effects of the jungle as outlined in paragraph 8 can be completely overcome only by experience, although common-sense talks are helpful. Training in jungle areas will do much to overcome these effects. In jungle warfare, as in all warfare, psychological and mental training to accustom the men's minds to the rigors of the battlefield are essential. The use of live ammunition and high explosives, overhead fire, and other phases of battlefield inoculation exercises are of in-

creased importance in jungle warfare training because the jungle itself adds to the mental strain encountered in other battle areas. Extensive training of this type should be conducted in noncombat jungle areas.

Section II. REQUIREMENTS OF JUNGLE SERVICE

25. Discipline

An unusually high state of discipline is essential for successful jungle operations. Mental discipline, camouflage discipline, fire discipline, march discipline, light discipline—all phases of conduct must be guided by a strict sense of the effects of one's every action on the operation as a whole. Discipline in all its forms should be so thoroughly inculcated in the mind of each man that he not only conducts himself properly, but knows that each of the other men in the unit will do the same, under conditions of uncertainty and profound psychological strain. Strict enforcement of discipline by unit leaders is essential in all phases of jungle service.

26. Suspicion

The jungle fighter must be constantly suspicious. The high degree of concealment which the jungle offers requires slow and careful searching for the enemy; elements assigned security missions must search every possible hiding place to prevent the bypassing of enemy groups which might thereby be enabled to attack from the flanks or rear. There is always the possibility that enemy observers may be concealed nearby to discover and report preparations for a forthcoming operation. It is best to assume that the enemy is always nearby, watching and listening. The limited visibility of the jungle facilitates deceptive tactics; adroit deception can frequently permit a small unit to overcome a force many times its own size. Ruses of many kinds may be applied. Demonstrations of strength in one area while attacking from another; ambushes; infiltration to attack command

posts, supply points, and disrupt communications; and extensive use of snipers are forms of deceptive and harassing tactics which are well adapted to jungle terrain. It must be borne in mind that ruses are equally usable by the enemy, and constant care must be exercised not to fall a victim to deception. Important ruses must be initiated and coordinated by the largest unit involved in a particular operation.

27. Patience

One of the primary requisites of jungle operations is stealth. Stealthy movement requires patience. Similarly, patience is necessary to detect stealthy movement of the enemy. Patience, though not an American characteristic, can be learned and developed by constant practice. It is an essential of successful jungle operations.

28. Scouting and Patrolling

a. Small patrols of trained scouts will be able to move through jungle areas, avoid enemy outposts, slip through hostile defenses, and penetrate enemy rear areas. Such patrols will often constitute one of the most important means available to the commander for gaining information of the enemy.

b. Special training of members of such patrols should include jungle lore, training in concealment, movement, observation, knowledge of enemy characteristics and habits, and the identification of weapons by sound.

c. For a detailed discussion of jungle patrolling, see section VI, chapter 4, and FM 21-75.

29. Leadership

The hardship of jungle operations demands the highest type of leadership. The difficulties of control necessitate decentralization, which results in increased importance of small-unit actions. Because of this, junior officers and noncommissioned officers must possess outstanding initiative, boldness, and determination. Similarly, the de-

velopment of self-reliance on the part of each individual is an important training objective.

Section III. WEAPONS, CLOTHING, AND EQUIPMENT

30. Weapons

a. Weapons must often be reduced to those which, with the required amount of ammunition, can be carried by the troops themselves or on the limited transport capable of moving with the troops. This frequently reduces the number of supporting weapons, requiring that tactical plans be based mainly on the use of weapons which can be carried by hand and which do not use too much nor too heavy ammunition. Decisions concerning the amounts and kinds of ammunition and weapons to be carried are command decisions which must be made by the local commander after careful consideration of the difficulties of transport and the types of weapons needed to accomplish his mission. Hand and rifle grenades and mortars, although heavy and difficult to transport, are highly effective jungle weapons; small-caliber weapons and ammunition, though less difficult to transport, are inadequate by themselves for the accomplishment of any large-scale mission.

b. Suitable weapons for use in jungle warfare, where observation and fields of fire are very limited, are short-range arms easily supplied with ammunition and readily transported over difficult terrain. The weapons which best meet the above conditions are the rifle and bayonet, automatic rifle, carbine, pistol, submachine gun, hand and rifle grenades, machete, and trench knife. The submachine gun and pistol have the advantage of using the same type of lightweight ammunition. The bayonet should be sufficiently short to reduce danger of its becoming entangled in vines and foliage. Hand grenades are the most important defensive weapons for night attacks and are invaluable in attacking dug-in positions; they may also be used in booby traps. Each rifleman should carry five or six hand grenades. The machete,

a tool indispensable to the jungle soldier, is also an excellent weapon for close combat.

c. Light and heavy machine guns and 60-mm and 81-mm mortars are less maneuverable, less suited to instant use, and require ammunition more difficult to transport; however, they are very valuable and can be transported by pack, small carts, or on the backs of men. Lightweight, 60-mm and 81-mm mortars, specially designed for jungle use, are more easily transported, and their effectiveness in jungle warfare is equal to that of the heavier models. Rocket launchers, firing either high explosive or white phosphorous rockets, are desirable for use against caves and well constructed defensive positions; flame throwers are also effective against such positions.

d. While light, mobile units are an essential in jungle warfare, their armament may be insufficient for the attack of strongly organized positions. Other troops, with heavier weapons, must be moved up rapidly to reinforce advanced units once such a position is uncovered. It must be borne in mind that jungle regions often adjoin savannas or other open areas, in which jungle growth is relatively sparse, as well as villages and towns from which artillery and other supporting ground weapons can be effectively employed. The prompt preparation of trails and roads for rapid movement of artillery is one of the primary missions of engineers. In preparing for operations in jungle regions, a careful preliminary study of terrain conditions in the probable area of operations will aid the commander materially in determining the composition and armament for the forces involved.

31. Clothing and Equipment

a. Each item of clothing and equipment must be considered in terms of its necessity, and serviceability in jungle environment. Lightness of weight is essential because of the difficulties of transport. Serviceability is essential, because of the problems of resupply. Every effort should be made to reduce to the minimum the

amount of equipment to be used, but care should be exercised that no essential items are omitted. During training, men should be required to use only items of clothing and equipment which will be taken into combat areas; not only will this teach them to live with a minimum of essentials, but also it may indicate the nonessentiality of some things originally thought to be necessary. Clothing worn during training should be of the same color and pattern as that to be worn in combat. To change will create additional difficulty in identification of friendly troops at a time when reduced visibility necessarily creates an identification problem.

b. Tight-fitting clothing is unsatisfactory, since such clothing is hot and restricts movement. Articles of clothing and equipment made of wool, leather, or felt have proven unsatisfactory for jungle use because of their heat-retaining qualities, absorption of moisture, and susceptibility to mold and fungus rot. Such articles should be replaced whenever possible by cotton, rubber, and canvas items. As an article of outer clothing, the combat suit, two-piece, dark green, herringbone twill, has been found highly satisfactory. Rubber-soled canvas boots are desirable for stealthy movement through the jungle, but are hard on the feet if worn for long periods. The issue field shoe, with composition sole, is satisfactory for general use. In some rocky areas, hobnails in the soles of the shoes are desirable. The helmet liner, M1, has been found to be much more satisfactory than the fatigue hat for jungle wear. In combat, the steel helmet may be easily camouflaged by the use of leaves and twigs held in place by a rubber band, or by the helmet net. A mosquito-proof head net and gloves are an inseparable part of each individual's equipment. A raincoat or a lightweight combination poncho and shelter half is indispensable.

32. Care of Weapons, Clothing, and Equipment

a. Weapons, clothing, and equipment receive hard usage in the jungle. Men must be trained to protect all

articles and to clean, dry, or repair them whenever practicable. Our weapons and equipment are the best and will not become unserviceable unless neglected, but the damp heat of jungle areas requires that special care be given to all weapons and other nonrustproof equipment in daily or frequent use. The humidity, the mud, and the frequent shortage of oil and other materials necessary for cleaning weapons combine to make weapon maintenance in the jungle particularly difficult. All weapons and equipment must receive constant preventive maintenance. The potential battle efficiency of a combat unit undergoing training can be determined almost precisely by the condition in which it maintains weapons and equipment. Equally, this reflects the military leadership qualities of its officers and noncommissioned officers.

b. One of the most important duties of subordinate leaders is to carry out frequent personal inspections to determine the state of maintenance of weapons, ammunition, magazines, spare parts, and accessories. Time and circumstances will rarely permit a thorough inspection of all weapons in a platoon at one time. Under such circumstances, frequent random inspections or spot checks will be made.

c. (1) All personnel (including officers) of a unit operating in the jungle should carry individual small cans of preservative lubricating oil. Extra oil must be carried by members of machine-gun squads.

(2) In hot, humid climates, light or special preservative lubricating oil should be used on weapons; in salt-water atmospheres, medium preservative lubricating oil should be used.

(3) Three or four cleaning rods must be carried in each rifle squad. Patches should be carried by each individual.

(4) Weapons must be disassembled, inspected, and cleaned daily; in rainy weather, it may be necessary to do this 2 or 3 times a day. By laying rifles on crotched

sticks several inches off the ground at night, and placing banana leaves over them, they can be kept dry.

(5) Breech mechanisms can be protected by tying an oil-soaked cloth around them. This should be attached in such a manner that the cloth can be easily removed by means of a quick pull on one end.

(6) Wooden parts of weapons should be inspected to see that swelling caused by moisture does not cause binding of the working parts. (If swelling has occurred, shave off *only enough* wood to relieve the binding.) A light coat of raw linseed oil applied at intervals and well rubbed in with the heel of the hand will help to keep out moisture. Allow oil to soak in for a few hours and then wipe and polish the wood with a dry, clean rag. Care should be taken to see that linseed oil does not get into the mechanism or on metal parts, as it will gum up when dry. The stock and hand guard should be dismounted when this oil is applied.

(7) Accessories, spare parts, and magazines will rust and deteriorate rapidly if not cared for diligently.

(8) Optical equipment such as mortar sights, compasses, and field glasses should receive special care. Field glasses and compasses, when not in use, should be protected from moisture.

(9) All machetes must be sharpened and oiled before going into a jungle operation. (See app. II.) If one man in the squad carries a small commercial stone, it will be found helpful for sharpening machete blades which soon get badly dulled and nicked.

(10) Tropical insects, especially termites and ants, will often damage or destroy fabrics or wood in a few hours. Therefore, whenever practicable, clothing and equipment should be *hung off the ground*, away from most of the destructive insects. Troops leaders must check each night to see that their men hang their clothing, packs, shoes, etc., from bushes, ropes, or other available supports.

(11) Exposing clothing and equipment to sunlight to dry them and kill germs is desirable. However, unneces-

sary exposure of fabrics to intense tropical sunlight weakens them and bleaches even the best of dyes. Camouflaged uniforms will fade more quickly if they are left for hours in the sunlight.

d. A tendency exists to turn in dirty clothes and to draw new whenever possible, rather than to launder the dirty clothes. When the situation is an active one, this is to be expected, as no time exists for washing clothes. When the situation is stabilized, and time, soap, and water are available, dirty clothes should be boiled and washed. *Enforcement of these provisions is a function of command.*

e. Immediate disciplinary action must be taken when men waste or lose their equipment through carelessness. Much equipment will be unavoidably lost or damaged incident to training and active operations. Such losses are legitimate, but wastage due to carelessness is a serious military offense.

Section IV. PRACTICAL HINTS FOR JUNGLE LIVING

33. Sleeping

a. During the dry season, men can sleep comfortably on the ground. They must, however, sleep under mosquito nets. (See ch. 2.)

b. (1) When sleeping in the jungle during the rainy season, a man must be off the ground and under a mosquito net. This is best accomplished by the use of an insect-proof hammock fabricated of light, durable, waterproof material. The hammock should be furnished with a rainproof, adjustable top with attachable insect netting, and should not exceed six pounds in weight complete with netting. In dry weather, a man can sleep on the ground in a sleeping bag improvised from ponchos (see figs. 2 and 3).

(2) Lacking a hammock similar to the one described above, improvised hammocks or jungle beds may be used. Hammocks are made of blankets, oblong pieces of canvas, or shelter halves. A two-man, off-the-ground jungle



Figure 2. Poncho used as raincoat.

bed may be made as follows: Four forked posts are firmly planted in the ground, the forks one foot above the ground. A frame of 2-inch poles is laid in the forks; across this frame thinner poles are laid. Poles are fastened together with vines or strips of bark. The platform is then covered with light branches and leaves to form a mattress. Care must be exercised that the branches and leaves used for this purpose are free of insects. A blanket is then spread over this mattress to hold



Figure 3. Ponchos used as sleeping bag.

everything in place; over all are pitched the shelter tent and mosquito net, or in dry weather, only the mosquito net.

34. Food

a. For jungle service, all food carried should give the maximum food value for the minimum weight. The use of utensils in cooking and transporting cooked food only creates danger of food contamination; to the maximum extent possible, foods should be limited to those which are ready to eat with the minimum amount of cooking.

b. Most foods eaten by Americans contain a high percentage of water in their natural state. Rations for long distance mobile foot operations should be essentially dry. Since water obtained locally in wet tropical regions may be made safe to drink by the use of purification tablets, its increased intake should make up for the lack of water in such rations, and is much simpler than back-packing water. Furthermore, since cooking or heating

food during jungle fighting is usually impracticable, combat rations are designed to be eaten with or without the application of heat. The advantages of ready-to-eat rations of minimum bulk and weight should never be forgotten by men operating on foot under exhausting jungle conditions.

c. All components of the C and K rations may be eaten unheated. Only the cocoa beverage powder, the lemon powder, and the coffee powder need to be prepared in any way. These powders dissolve in unheated water. The sugar can be used to sweeten any of these soluble foods to taste.

d. Variations in the ration can be provided by heating, although troops who are actively engaged cannot expect to eat hot meals. They must get along on field ration C, D, K, the 10-in-1 ration, or other prepared rations. Field ration D is suitable for use as an individual reserve and may be regarded as an emergency ration, however, it creates thirst and should not be eaten except when drinking water is available. Small cans of fruit juice may be issued to supplement the basic rations. Soy-bean foods, if obtainable, provide high nutritional elements.

e. All soldiers should learn how to cook rice, a staple of most oriental diets which will usually be contained in the captured rations of oriental armies operating in the jungle. Rice should be prepared with a small quantity of water, and steamed. Boiled rice, the meat and vegetable component of a "C" ration, and soy sauce make a good field meal.

f. (1) Waterproof food bags are designed to carry dry rations under humid conditions. Since these bags are made of high-grade coated materials, men should keep them for the many months of service they will give.

(2) The containers of the C and K rations protect their contents from insects, and from contact with humid air. However, this protection ends as soon as the containers of such rations, or of dry foods such as milk powder or dried fruit, are broken or opened. All *wet*

or *damp* foods must be eaten immediately after opening the containers. Dry foods, however, may be kept for several days, *provided* they are placed at once in waterproof food bags, and the bags are securely closed.

(3) To prevent humid air and insects from damaging rations in waterproof food bags, the mouth of each bag should be closed by binding its string tightly around its mouth, and securing it with a simple bow knot.

(4) Waterproof food bags are also very useful for carrying foraged foods, such as rice, dried meat, and nuts.

g. Clean food is essential. A lifelong disease such as amoebic dysentery may be contracted from eating even the smallest amount of unclean or contaminated food (see also par. 19). The following rules are basic requirements for keeping food clean:

(1) Keep flies and all other insects away from food and utensils.

(2) Stay away from native buildings. They are frequently the worst sources of disease.

(3) Wash hands before eating. The use of soap is essential if cleanliness is to be assured.

(4) Disinfect each drinking or eating vessel. A small amount of chlorine solution will kill germs.

(5) If forced to eat food cooked by natives, be sure to dish it up while it is boiling. Put it into a plate which has been washed and disinfected.

(6) Clean the top of every can and the can opener (or blade of knife used for can opener) by pouring a small amount of boiling water over them, or by using a small amount of disinfected water from the canteen. If the contents of the can are more than will be used at one meal, pour from the can into the mess kit only the amount desired for the meal. The remainder of the can is sterile and will keep until the next meal if it is protected from insects and not disturbed or contaminated by introducing into it a utensil or other device. There is no danger of keeping food in the original container if it is handled in this manner.

- (7) Cook all meats until they are thoroughly done.
- (8) Cook only enough food for one meal. Do not keep cooked food for future meals.
- (9) Remove the skin of any fruit prior to eating. Do not bite through the skin.

g. Men must be instructed never to eat with their hands. They must always use a utensil or they must fashion a spoon out of the top of a ration can, or a piece of cardboard from a ration container.

35. Cooking Utensils

a. Most cooking in the jungle is done by individuals or small groups of men who pool their resources and prepare food for themselves in one or two containers. Generally, the only cooking vessels available will be helmets, empty "C" ration cans, canteen cups, or the tops of mess cans. Heating the helmet will remove the temper and reduce its effectiveness.

b. Cooking utensils need include only a spoon and a metal vessel for boiling. The canteen cup is useful both as a cooking and eating utensil. Most foods obtained in the jungle can be cooked over an open fire.

36. Alcohol

Do not drink alcoholic liquor in the jungle. Taken in any quantity, it numbs the senses, and leads to excesses and the violation of fundamental health rules. It may be the direct cause of sickness which not only affects the man personally, but also decreases the effective fighting strength of the whole military team.

37. Medical Care

Frequently, the individual must provide his own first aid by attending to his own scratches and bites at once. If medicines are in sealed kits or are carried inside a pack, men will not use them early or often enough for preventive purposes. Each man should carry, easily available, a small bottle of iodine with applicator top and a small roll of adhesive tape. Water purification (Hala-

zone) tablets, salt (sodium chloride) tablets, atabrine or quinine, and a small bottle of insect repellent should be carried by each man. A supply of these items is included in the individual jungle first-aid kit, M2.

38. Trails

a. Trails are necessary for rapid progress in the jungle. The beds of swiftly flowing streams may be considered natural trails, if the water is not too deep. Before starting on any jungle trip, one should study the trails shown on maps and make inquiries of natives. Questions should be put to the natives in such form that they are forced to give information themselves, and cannot merely answer "Yes" or "No"; natives will almost invariably give an affirmative answer to a "yes-or-no" question. For example, one should ask a native: "Where does this trail go?" and not "Does this trail go to the village?"

b. It is usually safe to assume that trails exist between important habitations even if none appear on maps. Often a circuitous trail will be better than the most direct one, because during the dry season trails are often shortened by use of ground that is swampy and impassable in the wet season. Many trails that traverse steep slopes are very difficult after rains, especially if they have been traversed by pack animals. Maps can seldom be depended on for accurate trail routes, since trails change due to erosion, fallen trees, and swollen streams. During the rainy season, vegetation rapidly overgrows trails which are not regularly used. Aerial photographs do not show trails which lead through dense growth.

c. If unfordable streams are to be crossed, men and animals must previously have been trained to enter water and swim without hesitation. Care must be taken to prevent them from entering deep water with a full pack. Loads should be removed and towed across. A full pack load, much of which is above water, may drown the animal. Flotation bladders may be used by the men.

d. When not in close proximity to the enemy, and rapidity of movement is essential, full use should be made

of existing trails and stream beds. Movement off trails is laborious, and is impracticable except for special operations of short duration. The danger of ambush is greater along trails, but proper reconnaissance, patrolling, and use of scouts (especially native scouts and trained dogs) minimize the danger.

e. Natives are often in the habit of blazing trees as "sign posts," in a manner similar to that used by woodsmen throughout the world. The type and shape of the blaze mark can be used as a code to indicate where the trail leads to. In rear areas, artificial signs may be used. Rope or vines stretched waist high may be used to indicate the route of short trails at night.

39. Expedients

Jungle expedients require both originality and forethought. The following suggestions are offered as aids to development of expedients by individuals and patrol leaders:

a. Carry matches in a completely waterproof container, or carry waterproofed matches; otherwise perspiration alone will often make them useless.

b. Never go anywhere without a compass, preferably a lensatic or prismatic compass; be certain that its use is understood.

c. Carry a light hook and line or a light gig, such as a spear with barbed points, for fishing. A stick of black powder or other explosive may be used to stun fish. Explosives are the quickest and surest of all fishing equipment.

d. Next to the machete, a good pocketknife is a man's most useful possession in the jungle.

e. Ponchos, in addition to their primary use as raincoats, may be made into improvised sleeping bags, sun shelters, and tents. (See par. 33*b* and figs. 2 to 5 inclusive.)

f. A watch is useful in determining direction and estimating distances.

g. Most mud or other solids in water can be removed

by straining the water through a cloth or by stirring a small amount of alum into the water to cause the solids to settle. If used for drinking, the water must then be boiled or otherwise disinfected.

h. If lost, remember that if a man goes down slope he will come to a stream, and that watercourses, besides furnishing a means of travel and a supply of water and food, almost always lead to inhabited valleys or coastal regions.



Figure 4. Ponchos used as sun shelters.

i. Do not attempt to travel alone at night. Halt early enough in the afternoon to make camp, build a fire, and collect plenty of dead wood before darkness. Fires are advisable only when not in the presence of the enemy.

j. In order to build a fire in wet weather, first obtain shelter from the rain, and then split out the heartwood of dead limbs broken from trees. A small can of solidified alcohol is very useful for starting a fire if damp wood must be used for fuel. It will last for many days. The synthetic fire tablet may be used, if available.

k. Vines can be used in place of string or rope for many purposes.

l. Edible fruits can usually be identified by signs of animals having eaten them. Avoid eating unknown

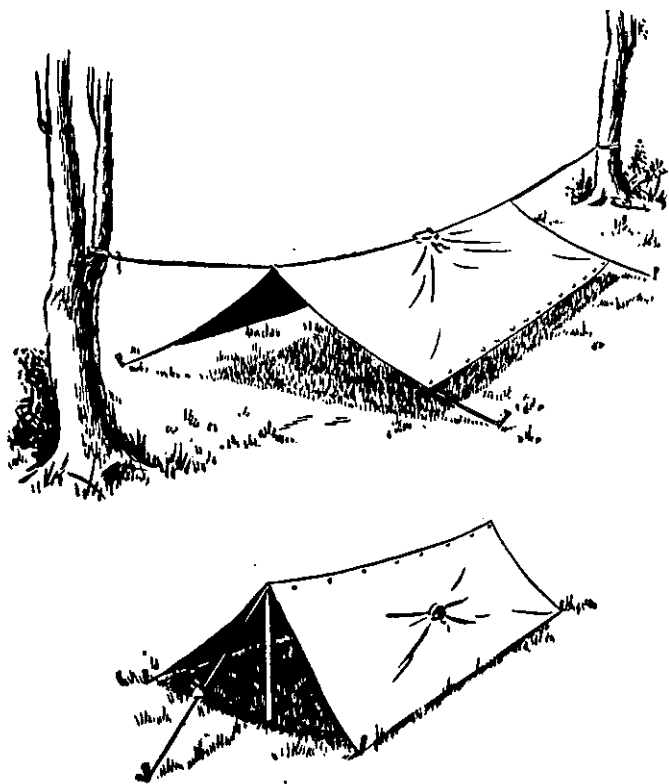


Figure 5. Ponchos used as tents.

fruits and plants except in emergency; some of them contain deadly poisons. (See app. I.)

m. Sleep off the ground to avoid dampness, reptiles, and insects. Climb a tree if mosquitoes and other insects are too bad near the ground.

n. If possible, travel with one or more companions.

o. Do not fear the jungle. A man can travel alone for weeks in uninhabited country if he uses his head and does not become panicky. Do not try to tear a path through vines or other jungle growth. Cutting a path saves energy. Pick a route carefully, making full use of the sun, the stars, the compass, and the terrain.

p. Do not try to bully or rush the natives. (See par. 45.)

q. Know how to find water, for it is indispensable. Small amounts can be found in certain plants, including the wild grape, the traveller's palm, and the water vine. Sand breaks in a coral reef often indicate fresh water several feet below the surface, since coral will grow in salt water only.

40. Jungle Navigation

a. For determining direction without compass, map reading in the field, and use of the compass, see FM 21-75 and FM 21-25.

b. Land navigation is one of the most important subjects of special training for jungle operations. Without a good knowledge of this subject, control is impossible. Without control, excellence in other phases of training goes for naught. The ability of all commanders and leaders to maintain control enhances the fighting value of the unit.

c. Density of vegetation makes jungle navigation difficult by day or night. Maps are seldom dependable for accurate portrayal of roads and trails which quickly become unrecognizable through erosion and undergrowth when not in constant use. Aerial photographs of jungle terrain seldom show more than the treetops, while limited fields of vision restrict the use of the compass. These difficulties can be overcome, however, by training the individual soldier in jungle navigation *in the jungle*. This consists of training of the individual's faculties, as well as training in use of the artificial aids given him.

d. If the use of trails is not restricted by tactical con-

siderations, they should be followed in the interest of rapid progress. A study of map trails should be made before starting on the mission. It is usually safe to assume that trails exist between important villages, even though not shown on the map.

e. Navigation through the jungle without dependence on roads and trails requires considerable map-reading ability. It implies skill in following a predetermined route through terrain which offers no landmarks, and knowing constantly one's location with reference to the starting point. *To do this successfully one must know the relationship between direction and the distance covered.*

f. Successful jungle navigation will be facilitated by:

(1) Movements of short distances at a time, 100 to 300 yards, with frequent checks of map with ground, measuring back azimuths with the compass when practicable. Direction once lost in the jungle is very difficult to regain.

(2) An up-to-date large-scale map or route sketch, preferably 1/25,000 or larger, together with a compass in good working condition.

(3) Navigating personnel. These include a map reader, a compass man, a recorder of detail, and a distance measurer who counts his strides, and computes distance covered by elapsed time. Personnel of this type should be thoroughly trained in advance.

g. Jungle navigators should be trained in the jungle. There is no substitute for this type of training.

h. If a man becomes lost, he should sit down and think calmly. He should ask himself these questions: Were my compass calculations correct? Where did I get off the route? In most cases, careful, calm thought will reveal where he went wrong.

i. The question of the route to be followed and the method of maintaining direction will depend upon the size of the objective to be reached. For example: if it is desired to reach a river known to be located west of the present position, it is only necessary to strike out

through the jungle, following the easiest route, but maintaining a general westerly direction. If the traveling is fairly easy and the route followed does not wind too much, the river should eventually be reached. If, however, it is desired to reach a native village which the map shows to be located on this river and due west of the present position, more precise navigation methods must be employed. Two possible routes could be followed to the village; first, a straight line going up and down the mountains and possibly across a swamp or two, or secondly, a course following a circuitous path, but one so controlled as to come out on the river at the village. The first route is the shortest one, but should not be the one chosen unless the country is reasonably flat, the jungle fairly open, and there are no swamps to cross—a series of conditions seldom found for any great distance in jungle terrain. The route actually followed in most cases should be a combination of the two methods; that is, following a straight line where the going is good, but skirting around a swamp or hill. If any route but a straight line is followed, however, it is necessary to keep a plotted record of the directions and distances travelled, in order to reach a final objective as small as a village.

j. In choosing the route, the general rule is that walking is usually best on the ridges and most difficult on the banks of the rivers (except small, fast streams with traversable beds). The jungle is usually more open on the ridges, drainage is good, and the ground is therefore less muddy. In addition, since walking is easiest on the ridges, animals and men have often made trails there. Walking along the river bank is likely to be difficult because of dense, second-growth jungle, mud, swamps, and side streams. The general rule therefore is to walk on the top of the ridges if they run in the right direction. If they do not, walk in the river valleys, but well back from the river's edge. If it is necessary to travel in the valley of a small stream, it may be easier to wade in the stream if the water is low and the bottom hard.

k. The easiest way to travel through the jungle is by

water if there are no rapids. If a boat cannot be obtained from the local inhabitants, a raft can be made. However, water routes are very vulnerable to ambush.

1. Because it is seldom possible to maintain direction in the jungle by landmarks, it is necessary to know how to navigate by the process of "dead reckoning." The process is similar to that used by a ship captain attempting to reach a small island in the middle of the ocean, if he were forced to sail other than a straight course and if he were unable, because of dense fogs, day and night, to determine his position from time to time by celestial observation. The process is to determine and plot on paper the direction and distance traveled on each leg of a journey. As an example, assume that it is desired to travel from village A to village B. The map indicates that the azimuth of the line from village A to village B is 45° ; that is, village B is exactly northeast of village A (see fig. 6). The map also indicates that the distance between the two villages is ten miles. Obviously the shortest path between the two villages is the straight line on an azimuth of 45° . But assume that it is not possible to follow this line because of a large swamp. To skirt the swamp it is necessary to leave village A on an azimuth of 90° ; that is, due east from the village. The traveller continues due east from village A for a distance of seven miles before he finds dry land on which he can turn north toward village B. He then sits down and plots his position on his map. He sees that village B must be due north of his present position and at a distance of about seven miles. He therefore turns due north and follows this line directly to village B. This is a simple case, as the course comprised only two legs, or elements. In actual practice, many more legs will often be involved, but the principle used is the same. The direction and distance of each leg of the journey is plotted on the map as a continuous line extending from the starting point. The position at any time is known, therefore, and the direction and distance from that point to the destination can be determined. (See fig. 7.)

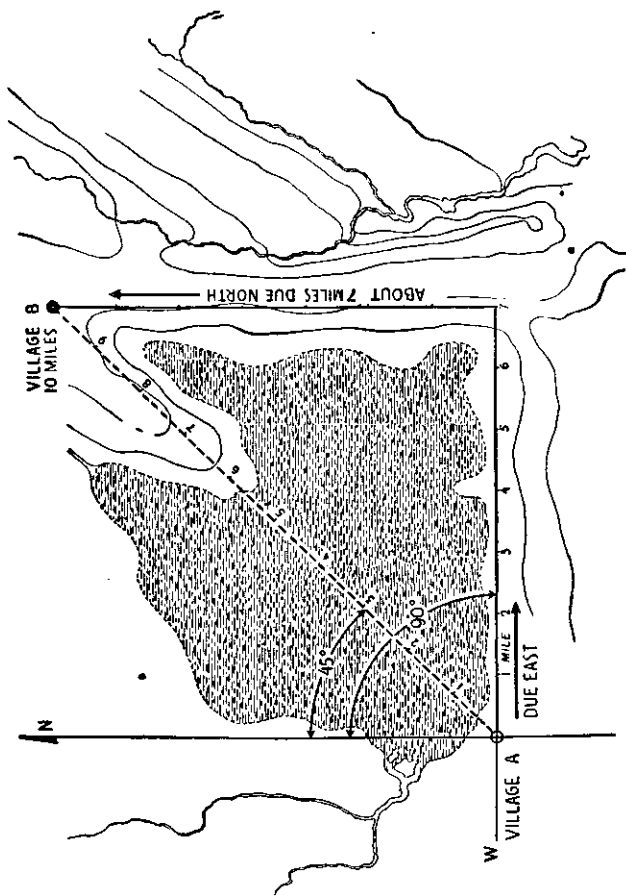


Figure 6. Jungle navigation by dead reckoning. The simplest case in which the course comprises 2 legs or elements.

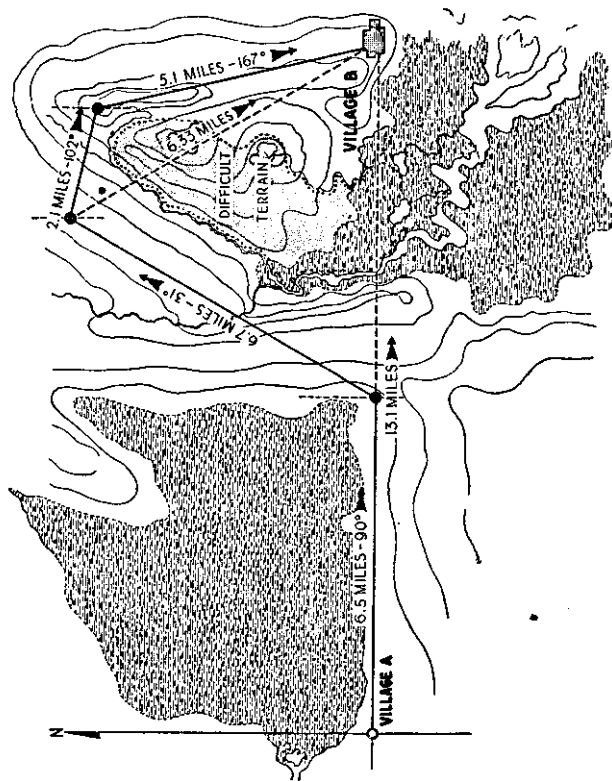


Figure 7. Jungle navigation by dead reckoning. Case involving by-passing of two obstructions, in which the course comprises 4 legs or elements.

m. There are two methods of determining distance by other than direct measurement. These are by pacing and by intervals of time. Pacing means counting the steps or strides (two steps) taken, the number of steps, or strides, per hundred yards being known. The average length of a step will be different for each man and it will vary for each individual depending upon whether the terrain is level or hilly, dry or muddy, wooded or open. This can be determined only by a man actually walking a known distance over each type of terrain at his normal gait and counting his steps or strides. With practice, considerable accuracy can be obtained by pacing. Another method of measuring distance for general jungle navigation is by time. No rules can be laid down for determining exactly the distance a man will travel through the jungle in a given time, however, this rate will seldom exceed one mile per hour. By using this figure as a guide, the rate of movement over varied terrain can be estimated with reasonable accuracy. By a check of the length of time of travel, the distance travelled can be calculated. Such checking and estimating will not enable a man to walk 10 or 15 miles from one village to another and come out of the jungle exactly at the second village. The method should, however, enable him to come close enough to the second village to encounter the trails leading to it.

n. If neither a compass nor a watch is available, the sun must be used for determining both time and direction. This method is, however, very inaccurate. On approximately 22 June, the sun is $23\frac{1}{2}^{\circ}$ north of the Equator; that is, over the Tropic of Cancer. Within accuracy limits suitable for jungle navigation, it will appear from any point within the Torrid Zone to rise 25° north of due east and set 25° north of due west. On approximately 22 December, the sun is $23\frac{1}{2}^{\circ}$ south of the Equator; that is, over the Tropic of Capricorn, and from within the Torrid Zone will appear to rise 25° south of due east and to set 25° south of due west. On

approximately 21 March and 23 September, the sun is directly over the Equator, and from any point within the Torrid Zone will appear to rise in the true east and set in the true west. With these few dates in mind it is possible to estimate the position of the rising and setting sun for any time of the year. It is then possible to estimate directions from the sun until about 1000 and after 1400. The sun may thus be used as a general guide in walking a line in any desired direction. The higher the sun above the horizon, the more difficult it will be to estimate direction by its location; during and about mid-day, its location will not serve as a practical guide to determine direction.

o. In attempting to use a shadow to determine direction, it is desirable to use an improvised plumb bob. A rock or piece of wood tied to the end of a 3- or 4-foot length of thin vine will serve the purpose. This method is unsatisfactory when the sun is nearly directly overhead.

p. Telling time by the sun is merely a matter of estimating divisions of the sun's arc overhead. For instance, half of the arc would put the sun directly overhead and the time would be noon. One quarter of the arc would indicate 0900, and three quarters of the arc, 1500. This is based on the assumption that the sun rises at exactly 0600 and sets at exactly 1800 when observed from any point in the Torrid Zone, which is not precisely true. The assumption is accurate enough, however, for practical purposes.

q. Another method of determining direction in the jungle is by the direction of prevailing winds. This is an exceedingly doubtful procedure and should be used only in an emergency. Although tropical areas are characterized by winds which blow regularly from one direction during a particular season, topography, local storms, and the trees themselves affect wind direction, making it impossible to determine directions from the wind with any degree of accuracy except by averages based upon observations covering a period of several

days. Factors close to the ground do much to influence the direction of the wind, but reasonably reliable estimates of direction can be made from observing the direction of the wind over water.

Section V. DEALINGS WITH NATIVE INHABITANTS

41. General.

a. Unless the sentiments of friendly inhabitants have been clearly determined, they must be regarded with suspicion. In general, since operations may be materially affected by their attitude, their friendship and cooperation must be cultivated. Men must learn that any act of violence or any effort to browbeat them can have serious effects.

b. Loyal natives have been used as scouts, guides, sources of military intelligence, carriers, litter bearers, and as laborers in rear areas. The extent to which they may be relied upon varies widely in different areas.

42. Native Troops

A commander of any expedition into jungle country should take early steps to ascertain the sentiment of natives. Once their friendly attitude is established, he should attempt to avail himself of their assistance to whatever extent possible. In some cases, a native auxiliary force may be formed. These troops will be of great advantage in operations over unfamiliar terrain. They provide a force at the disposal of the commander which, for scouting, raiding, and harassing enemy communications, will prove invaluable. Their familiarity with the terrain and knowledge of the people and the language will compensate for their limited military training. The use of native troops, organized and controlled by the commander, will not only help to lessen objection to the presence of our forces, but will strengthen solidarity against a common enemy. In some regions, native troops cannot be depended upon to stand and fight either offensively or defensively. They may be used in raids

or ambushes or assigned in small numbers to act as guides and scouts, to interpret, and to contact chieftains of native villages.

43. Limitations.

a. Some native tribesmen are experienced fighters, but others are bewildered by modern war. Reports by natives concerning the size, armament, formation, and equipment of the enemy cannot be depended upon and in every case must be verified. This is not deceit on their part, but merely a result of their lack of experience in military matters.

b. All official dealings with natives must be conducted through the proper agency. If there is no colonial agent or administrator available, dealings should be through the head man of the district, and all agreements relative to employment should be with him. All pay and rewards of cash, tobacco, cloth, or other medium of exchange must be made through the agent or head man. Individuals must not be permitted to barter or trade with natives except with the approval of the agent.

44. Languages

Although native languages vary widely, most natives of the southwest Pacific area are familiar with "pidgin English," and often, provided it is spoken slowly and distinctly, can understand correct English. Their replies in pidgin are fairly easily understood by anyone familiar with English, although the limited scope of pidgin does not permit involved or technical discussions. In Central America, Spanish is spoken except in rare instances. A working knowledge of this language is easy to acquire.

45. Relations with Natives

a. Natives are usually very particular about their womenfolk, and about such possessions as canoes, gardens, and livestock. In the absence of positive evidence to the contrary, it must be assumed that these are strictly

forbidden to anyone else; violation of this restriction is certain to bring disastrous results.

b. Native religions, superstitions, and customs must be respected at all times.

c. They react favorably to firmness, kindness, and justice. They are quick to take advantage of undue familiarity or excessive generosity (a common American trait).

d. They usually have very little sense of humor and do not understand American joking and "kidding."

e. Natives should always be paid a fair price for everything purchased from them. A jungle soldier must not use terrorist methods against the natives to get them to work for him or to conceal word of his whereabouts from the enemy. Jungle natives move about a great deal; members of a family frequently are not all at home at the same time; but if they are not threatened or abused, they will seldom give news of a soldier's presence to the enemy. Therefore, the jungle soldier who abuses or antagonizes the natives is working against himself. If a native is wronged, he becomes not only the enemy of the soldier who wronged him, but possibly the enemy of our entire Army.

JUNGLE OPERATIONS

Section I. GENERAL

46. Standing Operating Procedure

The constant limitations of low visibility and slow movement tend to reduce the potential flexibility of operations and hence permit a more extensive standing operating procedure (SOP) than is desirable on other types of terrain. Control will be facilitated by having the unit SOP include all activities which lend themselves to standardization without loss of effectiveness. Minor tactics, in particular, may be somewhat standardized and a variety of small operations planned and included as SOP, much in the nature of prearranged and rehearsed plays of a football or basketball team. However, tactics in general should not become standardized, lest the enemy become familiar with the standard pattern and anticipate the action.

47. Security

a. In general, security in the jungle is maintained in the same manner as in more open areas, except that the reduced visibility necessitates decreased dispersion of security elements.

b. Security in jungle warfare must be continuous. It must never lapse. In jungle warfare, there is no "front." It must always be considered that the enemy may appear from any direction.

c. Maintaining the initiative is the best form of security. The enemy is then forced to conform to our movements. The next best form of protection is provided by vigorous and aggressive patrolling. Counter-reconnaissance screens are useless, as it will always be possible for the enemy to infiltrate through them.

d. All positions, no matter how remote from the foremost troops, are likely to be attacked at any time. Security must be obtained by laying out positions in the

form of a perimeter capable of all-around defense. Every officer and man must have an alarm post, and everybody must be ready to fight. This includes personnel of all headquarters and all supply installations.

e. Night positions must furnish security, particularly during darkness and at dawn, facilitate distribution of supplies, and serve as lines of departure for the next day's operations. When taking up night dispositions, reconnaissance parties should reconnoiter bivouac areas during daylight, but the troops should not be brought into the area until just before dark. Patrols pushed out by each company will deter enemy patrols and mislead them as to the dispositions. Such patrols are withdrawn to the perimeter defense as darkness falls. This procedure makes it difficult for the enemy to reconnoiter the positions in daylight.

48. Reconnaissance

a. Map studies should precede a movement in a jungle area—if maps are available. Reconnaissance by air photos, including mosaics and strips, is valuable in that such natural features as rivers, lagoons, inlets, off-shore coral formations, and such works of man as coconut plantations, native gardens, and villages are clearly delineated; vertical photos, however, will not reveal terrain details hidden by a solid jungle canopy. Obliques will reveal the contours of the ground, though not to scale, and with considerable distortion. The most desirable types of air photos are stereo-pairs and vectographs.

b. Ground reconnaissance should, when possible, precede an attack in the jungle. This is often feasible if scouts are properly trained. It will not always be possible to determine the state of development of enemy defenses, but the extent of the defensive area usually can be ascertained. This requires alert, intelligent, and aggressive patrolling. Patrolling must be continuous, for the enemy is just as capable of making daily changes in his dispositions as are friendly troops. In most cases,

his day and night positions are not identical, except where defenses are highly developed.

49. Maps, Sketches, and Air Photographs

a. Maps of jungle areas are scarce and those available are usually very inaccurate except in the delineation of coastlines and principal rivers; the countless unnamed streams, inlets, and lagoons are seldom indicated, and contours, if shown, are seldom accurate. Except for coastal tracks and trails, and trail nets indicated on available maps can seldom be depended on, owing, in part, to the fact that trails are rapidly grown over and new and easier routes take their places. Native towns and villages may or may not exist as shown; when they do, they frequently bear native names entirely different from those on the maps; this is also true of a large number of terrain features.

b. Maps must be corrected at every opportunity. This is the duty of all officers, who should send corrected copies to higher headquarters, where corrections will be consolidated and checked, and new maps prepared.

' Section II. ARMS

50. Infantry

a. Jungle fighting is performed largely by infantry. Combat is usually characterized by close fighting. Whenever possible, infantry will be supported by other arms.

b. Prior to the initiation of operations in jungle areas, a careful analysis of the terrain must be made to determine the practicability of transporting and employing the various organic infantry weapons within each area of operations. Based upon this analysis and the mission, task forces are organized so as to assure maximum tactical mobility and combat effectiveness.

51. Artillery

a. The principles of artillery employment in open areas are equally applicable in the jungle, however, the em-

ployment itself presents many difficulties. The value of artillery support is so great, however, that every effort must be made to make this fire power available and effective. (See FM 6-20.) All calibers of artillery are desirable. The thick vegetation restricts the effective radius of shell burst so that in general, larger caliber shell are necessary than for similar targets in more open terrain. Artillery should be of sufficient caliber (105-mm and 155-mm) to blast away jungle undergrowth and also to destroy hostile positions. All such weapons should be capable of high-angle fire, and should be drawn by tractors capable of fording small streams. In some mountainous jungle areas, it may be impracticable to use other than pack artillery. Engineer equipment must be made available for the improvement of trails, construction of firing positions, and the clearing of fields of fire.

b. Forward observer teams are seriously handicapped by the jungle's restricted visibility. Usually they are unable to see the bursts and must adjust by sound spotting and sound sensing. Registration by high burst, smoke shell, or other visual means is preferable and is used whenever possible. Firing of unobserved fires, the data for which is based on maps or photo maps, can be used only to a limited extent. Triangulation may sometimes be used, and aerial observation is frequently possible.

c. The concealment which the jungle affords facilitates enemy raids on artillery positions and necessitates stronger close-in protection of such positions than in more open terrain.

d. Around coastal areas, plantations, and near beaches, there are usually adequate areas for the emplacement of artillery. Similarly, in jungle areas on islands, it frequently is possible to emplace artillery on nearby islands for long-range support of infantry operations.

52. Antiaircraft Artillery

a. Jungle troops in close contact with the enemy provide their own antiaircraft protection. Rear installations from which front-line troops operate, including supply depots and airfields, should have antiaircraft artillery protection even though air superiority is maintained. All calibers of antiaircraft artillery are suitable for jungle use, but their mobility is limited in the same manner as that of other artillery. Tractors are essential for towing the weapons, and bulldozers are necessary for trail and road maintenance and improving of fields of fire.

b. Antiaircraft weapons should always be sited for alternate, direct-fire missions at ground or water-borne targets. Frequently they can be employed in support of attacks on enemy positions on ridges.

53. Air Corps

a. The efficiency of the air arm in cooperation with ground troops is strictly curtailed. The complete leaf canopy prevents pilots from seeing troops on the ground, and troops are often unable to catch more than fleeting glimpses of the planes. Pilots usually cannot see identification panels laid out on the ground; it is often difficult for them to see panels or strips displayed in the tops of trees. Colored smoke pots placed on the ground may be used to indicate the position of ground troops but the high leafy canopy of the jungle frequently causes diffusion of the smoke to such an extent that pilots cannot see the smoke. Smoke rifle grenades fired upward, to produce colored smoke above the foliage, may overcome this difficulty. Sometimes, smoke containers may be hoisted or otherwise placed in the tops of trees, or on high ground to overcome this difficulty. (See par. 97.) Flares may also be used. Another method is to fire a vertical column from a flame thrower.

b. Although observation aviation has only limited usefulness in discovering and tracking an enemy moving

through the jungle, air observers will often be an effective aid in adjusting artillery fires.

c. Bombardment by airplanes is limited because of the difficulties of identifying targets. The lack of accurate maps and the absence of specific terrain features for use as reference points make target designation difficult. Firing smoke shells from mortars is a practical method of target designation.

54. Engineers

a. Engineers are a necessary part of every jungle force. They are employed chiefly for trail improvement and maintenance, bridging, preparation of obstacles and demolitions, the clearing of obstacles (see FM 5-30), water purification, and the coordination of defensive works. Engineer equipment and tools will be limited because of the problem of supply and transport. However, the jungle itself will furnish much of the material which, by improvisation, can be used in construction. One of the primary missions of engineers in the jungle is the construction and maintenance of roads and trails sufficient to permit the passage of $\frac{1}{4}$ -ton trucks for supply and evacuation, and to permit displacement of supporting artillery. Engineers equipped with modern road-building equipment may often profoundly affect the speed and scale of jungle operations. During prolonged wet weather, the maintenance of vehicular roads is most difficult, but under reasonably favorable weather conditions, considerable lengths of temporary vehicular track may be quickly cleared and made passable. Vigorous engineering reconnaissance is of prime importance, both to enable the commander to select the best lines of advance and to ascertain the location of native construction materials and water sources.

b. Engineer units also construct various beachhead installations such as unloading ramps, roads along beaches and to supply installations.

c. Engineer bulldozers are useful in establishment of dug-in medical installations and larger command posts.

55. Cavalry

a. Horse. Cavalry mounted on animals (horses, ponies, or mules) indigenous to the area may be of great use. Since imported animals cannot subsist on native forage, the transportation demands for their food renders them too costly. Furthermore, they are too susceptible to local diseases and require a protracted period of acclimatization.

b. Mechanized Units. The movement of tanks is impossible in heavy jungle unless routes have previously been prepared. Tanks may be used to advantage against definitely located, limited objectives where the terrain permits. Thorough tank-employment reconnaissance is necessary. Normally, tanks are restricted to coconut groves, beaches, grass- and brush-covered fields, tracks, or improved trails. When operating under these conditions, they are vulnerable targets for well organized anti-tank defenses. Frequently, tanks are attached to infantry companies; the two elements operate closely together, the infantry providing close-in protection to the tanks. The principal value of the tanks will be in the use of their cannon, flame throwers, machine guns, and crushing weight in the destruction of enemy bunkers and other field fortifications. (See also FM 17-36.)

Section III. MARCHES AND BIVOUACS

56. Marches

a. Troops moving on good jungle trails will rarely exceed a rate of 1 mile per hour. When moving over poor trails, their rate may be reduced to 1/2-mile per hour.

b. Night marches in the jungle are extremely difficult and should be avoided whenever possible.

c. Jungle trails usually restrict the formation to a column of files. Advance and rear guards are detailed. Countersniper personnel are designated. To facilitate control, to improve security measures, and as an aid to more rapid movement into battle, each unit in the column moves as compactly as possible. Connecting files maintain liaison between units in the column and between the

main body of the column and the advance and rear guards. Advance and rear guards should be changed two to four times daily. Within them there should be rotation of assignment as far as practicable. Since point duty is very fatiguing, the same squad should not constitute the point for more than two hours.

d. Flank patrols must be sent out when the situation dictates and the terrain permits. When a rapid movement is being made in an effort to gain surprise, it is not desirable to send out flank patrols if they have to cut trails, because the rate of movement of the column will be slowed, and the noise made by cutting may alert the enemy. (See par. 10b.)

e. All lateral trails should be investigated for several hundred yards, and covered by combat patrols until the column has cleared them. These combat patrols are sent out from the advance guard. After the column has cleared the lateral trails, the combat patrols rejoin the column, falling in at the rear. They rejoin the advance guard at the next hourly or other periodic halt.

f. Distances between men on trails varies from one to three yards depending on visibility. The column commander usually marches with the advance guard or at the head of the main body, in order to deal quickly with any situation. He should always have with him his S-2, S-3, and one messenger from each of the next subordinate units of the column, in addition to several messengers from his own headquarters group.

g. Radio communication with the column may or may not be permitted, according to the need for secrecy. Owing to the restrictions of radio silence, or mechanical breakdown of the radios, messengers will often be the primary means of communication. Another method is for wire parties to move with advance units, laying wire as they move, and thus insuring wire communication to the rear at all times.

h. (1) It is the duty of all personnel to observe strict trail discipline. The commands to halt the column will in all cases be given by an officer. Trail discipline is

of particular importance in the jungle, as the enemy is afforded opportunities for ambush that do not exist under normal conditions of combat. Trail discipline may be defined as alert, orderly conduct on the trail. The following points are emphasized:

(a) Prescribed distances must be maintained on a jungle trail. The distance between men and between elements of a column will be less than under normal conditions. Jungle trails are narrow and winding, and are often confined by walls of brush on both sides. Contact must be maintained, but all members of the column must be alert to prevent "telescoping" the column.

(b) Talking is prohibited except to transmit whispered orders or instructions.

(c) Men leave the trail and stand motionless on the approach of unidentified aircraft.

(d) At halts, men may relax *physically*. They can never afford to relax *mentally*.

(e) Men who cannot keep up must be left behind. (See FM 7-30.)

(2) Squad leaders are responsible for the enforcement of trail discipline. They insure that their squads are closed up, and that contact and proper distances are maintained. They do not permit straggling, falling out, or talking. They verify and pass on correctly all code words and instructions relayed through their squads by word of mouth.

i. The speed of the column will be largely dependent on the terrain, temperature, humidity, and condition of the trail. The rate of march must be adjusted to the speed that can be made by the men of the weapons platoon who are carrying machine guns, mortars, and heavy ammunition loads. On some terrain, the column may be able to march 40 to 45 minutes and rest for the balance of the hour. Under more trying conditions, the column may march for 15 minutes and then halt to rest for 10 minutes.

j. All men should be provided with salt tablets or ordinary table salt before the march starts. Troops

should be instructed by medical personnel how often salt is to be taken. The supply of halazone tablets or other medication in the hands of the men for the purification of water should be checked every time troops obtain drinking water.

k. All weapons must be thoroughly cleaned and oiled, and all ammunition inspected before the march starts. Oil-soaked rags, dark in color, that can be removed with a quick jerk, should be wrapped around all operating mechanisms to protect against humidity and the mud that will clog mechanisms if the men fall, as they frequently do. All rifles and carbines are carried loaded and locked. Automatic rifles and submachine guns are carried with magazines inserted, bolts forward. In the advance and rear guard, weapons are carried ready for instant use. In the main body, they may be slung. Except for members of the point, bayonets are not fixed during the march, since they catch in vines and bushes.

l. During a jungle march, two meals are eaten daily, morning and evening. No regular noon meal is eaten, although a rest period of about 45 minutes may profitably be ordered at about the halfway mark. During this period, men should be encouraged to drink chocolate, lemonade, or bouillon prepared from powder in the "K" ration. All these drinks are quickly assimilated by the body and are palatable and refreshing.

m. Columns on the march are halted only on the order of an officer. The identification number, initial, or code name of the officer should be passed with the command to halt the column. Thus: "Soup Bone says red light for 5 minutes," or, "H. B. says red light the column, message on the way." At every halt, all men immediately leave the trail and move into the bush on alternate sides, facing out in positions of readiness. If the halt is a periodic one of 10 to 20 minutes duration, security must be pushed out on both sides of the trail. The remainder of the men may relax and should be encouraged to do so; for those not on security, permission should be given to lie down or to rest against logs and

stumps. During rest periods, men must keep one hand on their weapons at all times. Periodic halts should not be ordered strictly on a time basis, but instead, at appropriate times, when the larger portion of the column is on ground that lends itself to defense.

57. Bivouacs

a. Bivouac areas must be prepared for all-around defense, with suitable fields of fire. Patrols should be sent out for a distance of 800 to 1,000 yards on all trails leading to the bivouac area, to determine if any enemy are nearby. Outpost elements are stationed on all roads, trails, and stream beds leading to or near the bivouac area. Figures 8, 9, and 10 show a suggested plan for movement into a bivouac area and disposition of units within the area. Frequently, the length of the column will dictate bivouac along the trail in depth. In such instances, security must be decentralized to the smaller units.

b. A bivouac site must first be defensible, and second be near fresh water. In the jungle, neither requirement will ordinarily be hard to satisfy. High ground is desirable for a bivouac, not only because it is more easily defended, but because it is freer from flies, mosquitoes, and other insects. Also, it is better drained and cooler. A native village should never be selected as a bivouac site. This precaution must be taken not only because the enemy may have the village spotted and because there may be unfriendly villagers present, but also because the unsanitary conditions of most native villages might subject our troops to many diseases.

c. The halt for the night must be made in time to permit the following:

- (1) A brief daylight reconnaissance of the bivouac area and assignment of units to sectors for all-around defense.

- (2) Movement of the troops into assigned sectors.

- (3) Clearing of limited fields of fire for automatic weapons.

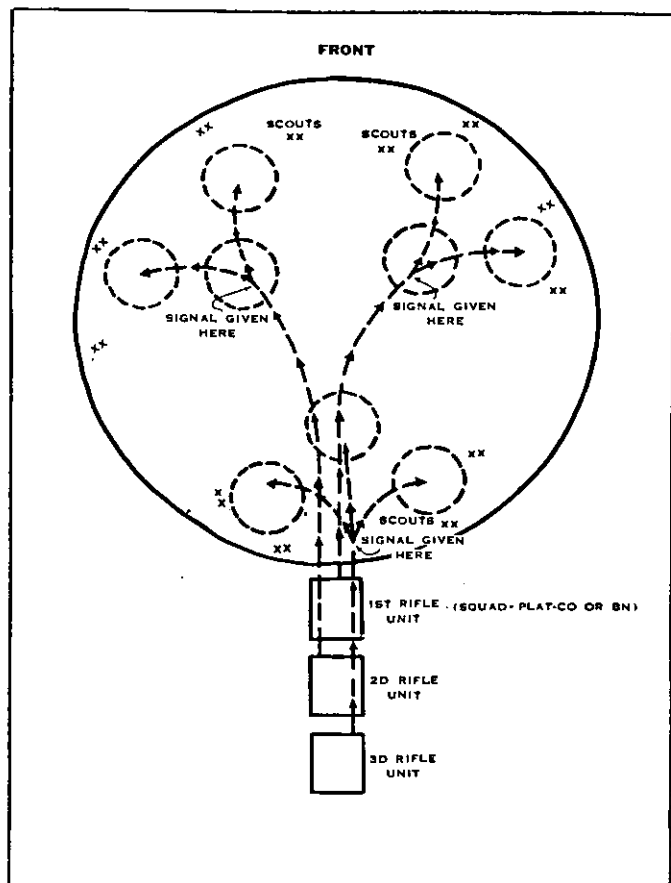


Figure 8. Movement from column into bivouac. This plan is applicable to a unit of any size. Occupation of such positions is usually a matter of Standing Operating Procedure.

(4) Preparation of hasty all-around defense. Digging of foxholes (2- or 3-man), siting of machine guns and other automatic weapons, and preparation of shallow emplacements. Installation of booby-trap warning devices around the perimeter. Distribution of extra hand grenades.

(5) Excavation of straddle trenches.

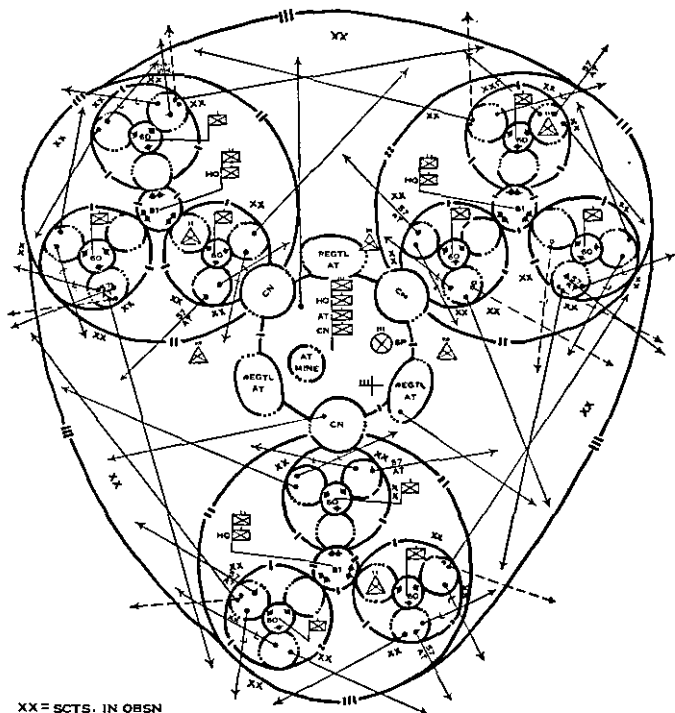


Figure 9. Perimeter disposition (schematic) of weapons and units within the regimental combat bivouac. When appropriate, a company may establish a single perimeter defense, rather than a perimeter defense for each platoon.

(6) Preparation and consumption of a meal.

(7) Completion of arrangements for sleeping.

d. A battalion requires approximately three hours to make these arrangements. Accordingly, the halt for the night should be made sometime between 1430 and 1600 in order to establish the bivouac before darkness. After the bivouac area has been selected and the troops moved into assigned sectors, the column commander should hold a conference, at which time the countersign for the

night and plans and orders of march for the following day are issued. In the meantime, platoon leaders supervise the establishment of security, the progress of fox-hole and emplacement construction, and the progress of

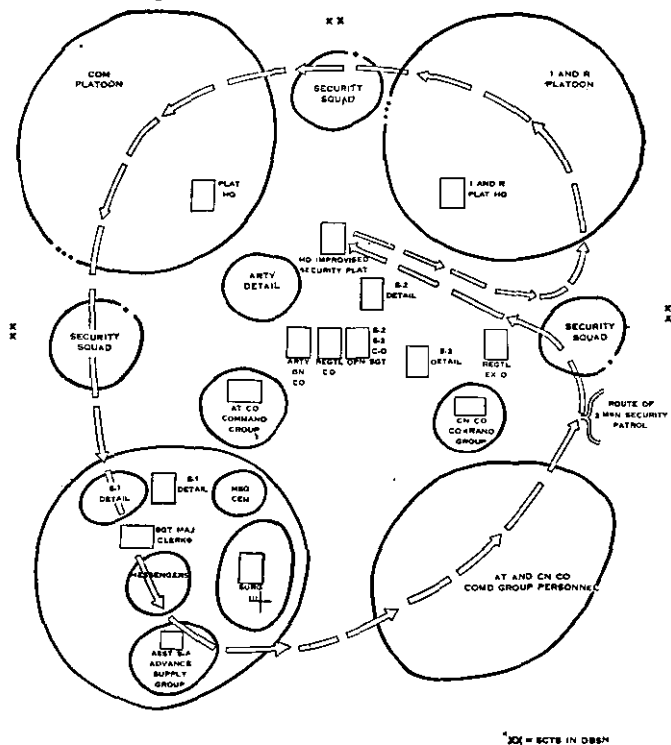


Figure 10. Perimeter disposition (schematic) of elements of the regimental command post. This disposition is applicable, in part, to battalion command posts.

the cooking. One-third of the men should prepare their food while another third prepare their individual positions, and the remaining third establish security. On completion of tasks, details are rotated within squads.

e. Each platoon must have a designated straddle trench. It may be desirable for each squad to have one. As far as possible, all calls of nature should be attended

to before darkness. If a man is required to answer a call of nature after dark he should dig a small hole near his foxhole.

f. All fires and other lights are extinguished at sunset. Cooking is done with canned heat, or similar smokeless preparations, or on one-burner cooking outfits.

g. After movement into the bivouac area, medical personnel examine and treat those who have foot complaints, coral cuts, or who have been slashed by jungle growth. At this time the daily atabrine is issued and water purification tablets and salt tablets for the following day's march distributed to squad leaders.

h. The countersign for the night is announced. Words chosen for use in countersigns should contain sounds known to be foreign to the enemy and therefor difficult for him to pronounce.

i. Machine guns should be emplaced to permit firing of interlocking bands of fire around the perimeter of the bivouac.

j. Mortars must be set up within the bivouac area so that they can fire barrages in support of the defense.

k. All weapons must be cleaned and oiled, and ammunition cleaned and inspected.

l. During the night, one-third of the command must stay awake. All men are alerted for a period of about one hour from sunset to darkness, and again for about an hour preceding dawn. Strict fire discipline must be maintained. There will be no firing, even at occasional snipers. Firing is justified only when an actual attack is being made on the position. There is a great tendency in the jungle at night to start "seeing things." This will result in indiscriminate firing unless positive measures are taken to prevent it. Such "blind" firing not only has a bad effect on morale, but also discloses our dispositions to the enemy. The best weapons in repelling night attacks are hand grenades, knives, bayonets, and machetes, because these do not reveal individual locations.

m. Approximately 1 hour of daylight will be needed to get moving in the morning. Men prepare and eat

breakfast, check the adjustment of their equipment, and move off on order. Security detachments are the last to move out of the area.

n. Squad leaders supervise the conduct of their squads in the bivouac area. When the column halts and the squad's area has been indicated, the squad leader moves the squad in. He posts a security group of two to four men forward of the squad area, while he makes a reconnaissance of the position. He then:

(1) Posts the automatic rifleman and indicates the sector for which he is responsible.

(2) Posts the riflemen and indicates to each the sector for which he is responsible.

(3) Supervises the clearance of limited fields of fire and the installation of warning devices outside the perimeter.

(4) Supervises the excavation of foxholes (2- or 3-man type).

(5) Ascertains and informs the squad of the location of the platoon or squad straddle trench.

(6) Ascertains and informs the squad of the location of the platoon command post.

(7) Ascertains the location and fire missions of adjacent squads.

(8) Checks on the preparation of the evening meal.

(9) Inspects weapons and ammunition and supervises distribution of extra ammunition and hand grenades.

(10) Inspects feet.

(11) Checks on the progress of work and insures rotation of groups.

(12) Checks to see that men are properly fed.

(13) Personally sees that each man takes his prescribed dose of atabrine.

(14) After securing orders from the platoon leader, issues the countersign and orders for the night. Informs the squad of the time of resumption of the march.

(15) Informs the squad of the situation, and the location of his foxhole and that of the assistant squad leader.

(16) Sees that the squad is alerted at sunset until 1/2-hour after darkness and that it is again alerted at first light, prior to dawn.

(17) Before the resumption of the march, checks the area for forgotten or mislaid equipment. Supervises police of the area.

o. With a unit the size of a company, it is desirable to halt at about 1500, feed, clean weapons, answer calls of nature, change socks and so forth in one area and then, about 45 minutes before dusk, move to a night bivouac area previously selected and reconnoitered. This bivouac area need be only a short distance from the area where the earlier halt was made. Movement to the night bivouac area must be made in time to allow siting of automatic weapons and excavation of foxholes.

58. Security

a. Bivouac area security is assured by a number of listening posts established along the outer edge of the perimeter defense. The men on these posts should remove their helmets. They may occupy two- or three-man foxholes. Either the two- or three-man foxhole is preferable to a one-man foxhole, because they allow the occupants to take turns at observing and listening, and they permit comradeship which has high morale value. Men may sleep in, or immediately adjacent to foxholes. No patrolling is carried on at night between these posts. Men should be trained to listen for the normal night sounds of the jungle. Any cessation of these noises is fair warning that something is abroad which is disturbing night life.

b. Warning devices in the form of booby traps improvised from hand grenades may be installed around the perimeter of the bivouac. Communication wire or vines may be used as trip-wires on these devices. Individuals responsible for the installation of warning devices must also be held responsible for their complete removal.

Section IV. ATTACK

59. General

a. The principles of offensive combat in the jungle do not differ from those of offensive combat in other areas; however, as in all other jungle operations, the methods of application of these principles are specialized.

b. Forms of the attack in the jungle do not differ from the normal. Penetrations, infiltrations, close and deep envelopments and encircling movements are employed in the jungle as they are in other places (see FM 100-5 and appropriate Field Manuals of the 7-series).

c. In the jungle, as in all combat, every effort is made to gain surprise. To this end, any measures that will increase mobility are usually adopted.

d. Because of the difficulty of maintaining control, it is essential that the mission and the plan of attack are understood by all personnel.

e. The attack against the jungle enemy may result from a meeting engagement. It may be a coordinated attack against a hastily organized position, or a coordinated attack against prepared positions of great strength.

60. Meeting Engagements

a. Other things being equal, the leader who with the greatest rapidity estimates the situation, arrives at his decision, issues his orders, and executes his plan, will be successful. By rapidity of action, he seizes the initiative and gains surprise.

b. If emplaced artillery is supporting or is attached to the column, it should be used as soon as possible if the enemy appears to be in strength. Supporting artillery fires are controlled by forward observer teams of artillery personnel who communicate directly by phone or radio with their battery or batteries.

c. 60-mm mortars should bring short-range fire to bear as quickly as possible. Control is by voice.

d. As soon as 81-mm mortars are emplaced, they are assigned targets. Their fire is controlled by forward observers, who use sound-powered telephones.

e. It is not always possible for the commander to make a reconnaissance. When there is opportunity for any reconnaissance, even though closely limited, it must be made. Scouts and patrols investigate the extent of the enemy position and try to determine his approximate strength. The nature of the engagement and the limited observation may require the commander to make his estimate and decision and to issue his orders based on very limited information. To await additional information might result in loss of initiative.

f. Should the commander decide on an envelopment, the enveloping force must move out rapidly. Orders are always oral. The commander indicates his desires as briefly as possible with the aid of maps, air photographs, hasty sketches, or diagrams traced on the ground.

g. The enveloping force must always indicate by prearranged signal when it is in position and ready to attack. If wire-laying teams can keep up with the enveloping force, the signal will be transmitted by wire and radio. Signals can be transmitted in the clear once battle is joined. If no wire can be laid, the signal may consist of prearranged colored flares or any other available visual means. Flare signals should be repeated. These signals are necessary in order that friendly fires can be lifted so the enveloping attack can close with the enemy. The principal objection to signaling by flares or by the firing of weapons is that both methods disclose the position of the enveloping force, and the psychological factor of total surprise, which frequently can be achieved in the jungle, is lost.

h. The following features common to meeting engagements should be noted:

(1) There is no stage of development of the column. The troops move from route column to departure positions.

(2) Artillery and mortar fire is brought down on the enemy immediately upon contact and he is held under as great a volume of accurate fire as possible during movement of the enveloping force.

(3) The enveloping force must move rapidly. At the same time, the men must arrive at the departure position in physical condition to enter the fire fight.

(4) In a meeting engagement, it may not be possible to use supporting aircraft even if they are on call. Because of the pilots' inability to see, the ground commander may neither be able to indicate to them his own position and progress with precision, nor to pin-point the enemy installations which he wishes the planes to attack.

(5) If aircraft are to be used, the plans for their employment must be made known to the leader of the enveloping force, and the pilots carefully instructed as to the areas, times, and direction in which it is desired that they make bombing and strafing runs.

(6) If supporting fires are being delivered, the officer commanding the enveloping force must give the signal for lifting.

(7) Provision must be made for protection of the rear, and defense against enemy counter-envelopments by the use of reserve elements. If not required for such purposes, reserve elements can be employed to exploit a success or extend an envelopment, but they should always be held out initially until the situation is developed.

61. Coordinated Attacks Against Hastily Organized Positions

These do not differ in execution from the attack just described. Single or double envelopments or circling movements are used when possible. The following points should be noted:

a. Reconnaissance can often determine the location of automatic weapons. The lateral extent and depth of the enemy position may also be ascertained by small ground patrols with a fair degree of accuracy.

b. When observation permits, artillery may be registered and all fires massed for preliminary bombardment.

c. Since time is available to locate and describe the enemy position, supporting aircraft may be employed on dive bombing and strafing missions prior to H-hour.

d. Time may be available to get heavy supporting weapons into position.

e. The attack must be conducted from objective to objective in order for subordinate leaders and commanders to regain control frequently and reorganize for further advance. For a unit as small as a platoon, the distance between objectives usually is short, and may not exceed 100 yards. Visibility is the governing factor.

62. Coordinated Attacks Against Elaborate Defenses

a. The methods of reducing elaborate defenses require the application of effective fire power. When the attackers are called upon to reduce a system of defended localities, they may expect to encounter heavy bunkers, barbed wire, and antitank and antipersonnel mines.

b. Movement alone does not suffice to force the Japanese enemy from bunkers or pill boxes. He must be forced to surrender or be burned or blasted out of them. In attacks against positions of this type, the frontages must be narrow in order to insure the greatest possible concentration of fires. As in all jungle attacks, limited objectives must be established or control will be lost.

c. The preparatory phases of such attacks involve construction and improvement of roads and trails behind friendly lines, the movement of supplies and ammunition, and the coordination of all arms and weapons that are to be used in delivering and supporting the attack.

d. If naval gunfire can be used to advantage, it should be requested, and a schedule of the fires desired worked out in advance. The presence of a naval liaison party on the ground is most helpful to assist in directing the gunfire. Direct radio communication between the ship and shore should be provided.

e. Arrangements should be made for maximum artillery preparation and continuing support by all available artillery according to a time schedule, or on call. The artillery may require several days for regrouping, displacement to new and better positions, and registration.

f. Air liaison officers make ground reconnaissance,

employing every possible means to locate accurately the targets for preparatory dive bombing and strafing attacks.

g. Continuous reconnaissance by air photo is made and stereo pairs and vectographs studied daily to gather all possible information of the terrain. Terrain or sand-table models of the area to be attacked are an excellent aid to briefing of leaders.

h. Every attempt should be made to capture prisoners prior to the attack. Frequently, this will be difficult, but the close jungle terrain favors an ambush (see par. 77) and small patrols can ambush parties on trails. Such patrols usually consist of not more than three or four men, all of whom must be experienced jungle fighters and expert riflemen. It should be borne in mind that a steady flow of prisoners at all times is highly desirable for intelligence purposes.

i. Daylight patrolling must be continuous. An aggressive attitude must be maintained. Patrols secure information, keep the enemy on the defensive, inflict casualties on him, and prevent him from patrolling. Patrol leaders are given the priority when both combat and reconnaissance missions are prescribed.

j. Prior to the jump off, artillery and naval gunfire attack assigned targets. They concentrate their fires on the first infantry objective. If large-caliber artillery is employed, its fires will probe more deeply into the enemy position. Fires may be lifted at a prearranged time or on signal passed over all communication channels and by flares. When the fires of the heavier guns are lifted, the mortars in close support of the infantry should lay down their concentrations. As soon as fire lifts, the troops must assault. Provision must be made for mopping-up units to follow the assault waves closely. Such units search out stragglers and blow up emplacements. During the period of reorganization and preparation for farther advance by assault units, mopping-up units hold the ground gained.

k. The capture of the objective must immediately be announced by pyrotechnic signals or over all wire and radio circuits so that previously planned protective fires may be brought down around the objective to protect it from enemy counterattack.

l. The second objective must not be too distant from the first. Following the capture of the first objective and prior to the jump off for assault on the second, assault elements must reorganize. A commander must expect delays during the progress of a jungle attack.

m. The maximum possible latitude in the execution of orders must be allowed subordinate commanders and leaders. Limited observation and the difficulties of movement in the jungle make all tactical situations obscure, and exact actions of subordinate units cannot be prescribed. It is usually impossible for a regimental or battalion commander to control the actions of his assault units once they have been committed. He supports them by all means at his disposal.

63. Use of Tanks

Tank operations are limited by the conditions outlined in paragraph 55. Because jungle terrain thoroughly canalizes tank movement, the danger of antitank fire and ambushes by tank-hunting parties is great, and tanks must be closely protected by infantry. Frequently one or more tanks may be attached to a small infantry unit for the reduction of enemy pill boxes or other emplacements by close-range fire. In such cases, the tank(s) must be surrounded by infantry patrols which reconnoiter for routes of advance, antitank guns, tank traps, or other antitank obstacles, and protect the tank from tank-hunting parties. Close coordination between tank and infantry leaders is essential. In some cases, special radio equipment will facilitate this coordination; frequently direct communication is maintained by telephone between the infantry leader advancing immediately behind a tank and the tank leader inside the tank. Information as to routes and antitank resistance reported to the in-

fantry leader by his patrols can thus be passed on to the tank leader(s). In such cases, the rate of movement of the tank(s) must be reduced to that of infantry. However, the above method will permit armored direct fire power to be brought well forward thus avoiding the difficulties imposed by limited fields of observation.

64. Night Attack

Night attacks in the jungle are seldom desirable because of the extreme difficulty of control. However, the possible surprise effect of a night attack might, in some cases, make such an operation worthwhile. The doctrines applicable to the execution of night attacks are enunciated in FM 100-5 and Field Manuals of the 7-series. The characteristics of the jungle will frequently modify the application of these doctrines, as indicated below.

a. The number of columns into which the assaulting units are divided will ordinarily depend on the number of existing trails within the zone of action and leading toward the enemy position. To cut new trails beforehand is a slow, noisy process likely to warn the enemy of the impending attack. While small groups (such as a squad) of experienced men may be able to move quietly through the jungle, a large group is likely to betray itself. While it may be possible for one or more small assault parties to approach directly through the jungle, it must be considered as axiomatic that night movement will ordinarily be confined to trails, stream beds, or similar features, easily identified and followed.

b. Jungle conditions increase the difficulties of coordinating the time of attack of columns. If effected by a time schedule, ample allowance must be made for delays, even if the columns move on trails. Landmarks and easily distinguished features will be scarce or entirely absent. Because of the dense overhead growth, pyrotechnic signals may not be seen by all column leaders, and dampness and heat may make the pyrotechnics themselves undependable. Preliminary reconnaissance and a careful analysis of the conditions under which the attack

is to be launched will permit the commander to effect the proper coordination.

c. Even to a greater degree than in open areas, night attacks in the jungle must be conducted on a small scale and with limited objectives. Where suitable avenues of approach exist and mobile troops are available, a movement around the hostile position at night, followed by early morning attacks against hostile rear areas and installations, may prove a major factor in the demoralization and defeat of the enemy.

d. Assault troops must depend on the bayonet, grenade, and machete. If the attack is made over an open area in the jungle, it is organized and conducted as in open areas in ordinary terrain.

e. Preliminary reconnaissance, the use of guides, the identification of distinguishing marks, and maintenance of quiet will be more difficult than by day. On the other hand, the assault will be in no danger of observation, even on moonlit nights, for troops will not cross open skylines, fields, or highways.

f. When supports are placed in rear to cover a possible withdrawal, they must be close to the avenues of withdrawal. They should preferably be located along the trails, facing the trail and not the enemy position, so that they can quickly strike with the bayonet elements of the hostile force seeking to overtake the retiring assault units.

Section V. DEFENSE

65. General

a. Defensive combat in jungle terrain does not differ in principle from defensive combat in other types of terrain. For principles governing defensive combat, see FM 100-5, and Field Manuals of the 7-series.

b. The extent to which a defensive position is developed depends upon the length of time available for construction purposes, the length of time the position is expected to be occupied, and the material, equipment, and troops available. Defensive installations are constantly improved as long as the position is occupied.

66. Organization of the Ground

a. The principle of all-around defense of the position is of outstanding importance in the jungle. The limited fields of observation facilitate the enemy's approaching the position to very short range without being detected. Infiltration is facilitated, and the danger of attack from any direction increased.

b. When possible, one or both flanks should rest on a natural obstacle such as a river, lagoon, swamp, steep cliff, or the sea. While such features constitute obstacles to the attacker, they should never be considered as insurmountable barriers, and provision must be made to meet with fire the enemy who attacks through them. All terrain is passable. *There are no impenetrable jungles, impassable swamps, unfordable rivers, or unscalable cliffs.* The commander who assumes that his command is protected by an impassable barrier courts disaster. Countless experiences have proved that *no terrain is impassable to troops who have been trained to make their way over it.*

c. The strength of the unit, the terrain, and the enemy situation are all factors determining the type of defense to be adopted. Mutually supporting defensive "islands" are established whenever possible. In the jungle, limited fields of fire and fields of observation might make it impossible to establish such a position. If the terrain does not permit such a disposition, a *shoulder-to-shoulder* perimeter defense is the next most desirable, since it closes the formation to such an extent that infiltration by the enemy is made difficult.

67. Security

a. To prevent surprise by the enemy, an outpost position should be established around the main battle position. Outposts must be of sufficient strength to delay the enemy in his approach to the position, and prevent his attacking before the occupants can be alerted. The difficulty of night movement, however, usually makes it

necessary for the outpost to withdraw from its position and return to within the perimeter before dark.

b. Trip wires connected to rattles, booby traps, or illuminating flares may be installed around the position at night to provide warning of the approach of the enemy. Other means may be improvised for illuminating the enemy at night. Cans filled with gasoline and having a remote control system of ignition may be placed in strategic areas and ignited when the enemy approaches. Locations for such illuminators must be carefully selected. They should be far enough from the position to silhouette the enemy while he is in the field of fire of the position. They should also be sufficiently far from the position so that the light will not blind the defenders nor illuminate them for the enemy. The length of the illumination period can be controlled by the amount of gasoline or other fuel used in the device.

c. Companies responsible for the defense of outer areas of the perimeter send out patrols to investigate areas forward of their positions. These patrols should move out from the perimeter just before dawn, and return about an hour later. In the evening, patrols should move out about an hour before sunset, and return just before darkness. This will provide additional security to the position during the hours when conditions of light are most favorable for an enemy attack.

d. Platoons and larger units always establish supports and reserves within the position to deal with infiltrating enemy troops, reinforce areas that are hard pressed, and, in the case of companies and larger units, to counter-attack.

68. Automatic Weapons

a. The location of automatic weapons in the position is of primary importance. The enemy may be expected to make every effort to locate and destroy them early in his attack. Such weapons must be moved frequently between primary, alternate, and supplementary positions, and constant care exercised to maintain deception as to

their true locations. Machine guns must be protected by members of their squads armed with carbines. If machine-gun squads are so depleted that they are unable to provide this protection, it must be furnished by adjacent rifle units.

b. The manner of employment of machine guns depends upon the terrain, the extent of the sectors to be covered, and the number of likely avenues of approach to the position. It will often be desirable to employ machine guns singly, instead of by section, in order to provide continuous bands of interlocking fires around the position, and to cover all likely avenues of approach thereto.

69. Fields of Fire

Cutting of vegetation to improve fields of fire is held to the minimum. All cutting should be carefully planned and controlled by squad and platoon leaders. Particular care must be exercised in improving the field of fire of automatic weapons. To clear the area in front of the weapon will plainly indicate the weapon's position. A fire "tunnel" 1 to 4 yards in width, but with overhanging foliage and shrubbery left in place is difficult to detect, and offers the defender the same type of grazing fire as he has when he clears the area of all undergrowth.

70. Supporting Weapons

As soon as the position is occupied, artillery and mortars should register, and protective concentrations should be planned. Arrangements should be made for massing all protective fires on any selected point. Maps and overlays showing planned concentrations should be in the hands of all company commanders. Information concerning the location of planned concentrations protecting platoon areas should be given to all platoon leaders.

71. Fire Control

Authority to call for final protective fires covering company areas is delegated to company commanders. The extent of decentralization of fire control is dictated by

the size of the battle position, the type of terrain, and the higher commander's range of observation. Companies whose defense areas are not under attack, or whose weapons are not required to fire in support of areas which are under attack, will exercise fire discipline to prevent disclosure of their positions.

72. Counterattack

Plans must be made and movements practiced for counterattacks to restore company and battalion positions which might be penetrated by the enemy. Brief but intense mortar and artillery concentrations in preparation for such counterattacks are planned. Counterattacks must be launched before the enemy has had opportunity to consolidate a position he has succeeded in taking.

73. Night Defense

a. To forestall night attacks by the enemy, intensive patrolling is conducted to prevent his daylight reconnaissance of the area.

b. Strict fire discipline must be maintained, particularly during darkness. The primary weapon for defense against night attacks is the hand grenade. Knives, bayonets, and machetes are also used. Rifles and automatic weapons are fired only in the greatest emergency or when grenades are gone, since their flash discloses the location of the defender to the enemy. (See par 571.) Small enemy groups which may try to infiltrate the position during darkness should be dealt with by bayonet when possible. All bayonets should be fixed at night.

c. Hand grenades may be used at night. They should be carried on the person, either in pockets or in bandoleers. They should never be carelessly scattered about loose in foxholes; a small shelf within the emplacement is a convenient place for storing extra hand grenades.

d. One method of night defense is for all members of the unit to remain in their foxholes when attack is imminent; thus anyone outside his foxhole is assumed to be an enemy who has infiltrated the position and is subject to

immediate attack. There is no withdrawal from a position during a night attack. All men must understand that they are "frozen" to their positions regardless of what happens.

Section VI. PATROLS

74. General

a. For the general principles of patrolling and the detailed instructions concerning the operation of patrols, see FM 21-75.

b. Patrolling is carried on to secure information, to deny information to the enemy and to attack and destroy enemy patrols, groups, isolated detachments, and supply points and other key installations.

c. Night patrolling is difficult in the jungle unless the patrol keeps to a defined trail or track. In jungle terrain, either on or off trails, patrols will operate in column formation most of the time. It is generally not feasible to have a number of separate groups hacking their way through the thick growth at the same time; progress is too slow, the elements of the patrol become isolated, and too much noise results. Progress through the undergrowth is of necessity in a column. Nevertheless, provision is made for flank groups in all jungle patrols; while these groups may not function on the flanks during forward movements, they observe to the prescribed flank and move out to the limit of visibility up to 100 yards during halts when march outposts are established. When normal terrain is entered, the designated flank groups function on the flanks in the usual manner. Jungle formations of 8 men or larger may be regarded as collapsed diamond formation, drawn together by terrain restrictions, but opening out to the normal form when the restrictions are no longer present. Jungle patrols must be assigned clearly defined sectors in which to operate.

d. The urgency of the mission will indicate the route to be followed by a patrol. When the jungle growth permits, all patrols should operate off the trail, but guide on it. If speed is essential, the patrol will have to operate

on a trail or track. When so doing, the members must bear in mind that they are in constant danger of ambush. They must observe trail discipline and proceed alertly, ready for instant action. Small reconnaissance patrols should operate entirely off trails.

e. If a patrol is to be absent for a period of 6 or 7 days or longer, it should establish a small, hidden base from which it can operate. This base must be well removed from traveled trails. If the patrol is small, no security personnel need be left at the base. On return to base, the patrol must use the utmost caution. If the patrol is large, it should leave a security detachment at the base. By establishment of a base, the patrol is able to operate with the minimum of equipment, thus increasing its mobility.

f. All patrols should have one or more assembly points selected by the leader in advance. This is necessary in case the patrol meets superior opposition and is forced to disperse. At the assembly point the leader can rally his patrol and give fresh instructions for the accomplishment of the mission.

g. For sudden encounters, all patrols, regardless of their size, should have a planned scheme, or SOP, for engaging the enemy to the left, right, front, or rear. Each member must be instructed in the action which he is to take automatically in each case.

h. Friendly units through which a patrol must pass will be informed of the times and places where the patrol is expected to clear the lines and to return through them.

i. Patrols will be armed and equipped in accordance with their missions. All jungle patrols must be equipped with machetes or jungle knives for cutting trails. If the patrol is to be out over night, head nets must be taken. A supply of atabrine tablets, salt tablets, and halazone tablets or other medication for water-purification must be carried and used, regardless of the length of time the patrol is to be away from its unit or base.

j. A sufficient quantity of maps or air photos of the area are taken. Care must be exercised that such maps or photos do not provide information which would be of value to the enemy.

k. If radio communication is to be used between the patrol and its unit, operating schedules and frequencies must be carefully planned before the patrol leaves. Sufficient personnel to operate the radios, and to replace radio operator casualties must also be included in the patrol. The range limitations which the jungle imposes on radios must be carefully considered.

l. If native guides are to be used, they must be contacted in sufficient time to permit the patrol leader to interview them.

75. Combat Patrols

a. The size, armament and equipment of a combat patrol depend on the mission assigned it and the available information of the enemy in the area in which it is to operate. A combat patrol, though not ordered primarily as a means of gaining information, gathers and reports all information possible, as a secondary mission. Combat patrols vary in size from three or four men, to a platoon or more. It is often desirable to increase the proportion of automatic weapons within the patrol. Carbines are frequently more desirable than rifles, because the reduced length of these weapons lessens the difficulties of movement through thick undergrowth. If a demolition mission is assigned, sufficient personnel trained in demolition work must be included in the patrol. Under such circumstances, the mission of the rest of the patrol may be to protect the demolitionists while they are doing their work, and while withdrawing.

b. All members of the patrol must be familiar with the enemy situation in the area in which the patrol is to operate. They must be familiar with the patrol's mission, route of advance and withdrawal, and the leader's plans for accomplishment of the mission.

c. Before the patrol's designated time of departure, the leader will inspect each member to insure completeness of equipment, knowledge of the patrol's plans, and his physical condition.

d. Competent aid men should accompany a combat patrol. If a patrol is a large one and expects to be gone for several days, a medical officer should be a part of the patrol.

76. Reconnaissance Patrols

a. A reconnaissance patrol is sent out for the specific purpose of gaining information of the enemy or of the terrain. Reconnaissance patrols are small so that they can move rapidly and secretly. They move rapidly when possible, but concealment and positions from which enemy activity can be observed are the determining factors in their conduct. It may be necessary for them to fight in order to accomplish the reconnaissance mission.

b. *A Three-Man Patrol (Scout Team)* usually consists of one man armed with the rifle or carbine acting as a point, followed at 10 to 20 yard distance by a second man armed with the rifle, who is in turn followed at 10 to 25 yards by the third man armed with a light automatic weapon. All members of the three-man patrol may be armed with the submachine gun. The leading man gives his entire attention to observing the ground to the front and flanks, the second concentrates on observing for tree targets, and the third furnishes the fire power for protection of the group, and observes to the rear. The distance that is maintained between individual members of the team, 10 to 20 yards normally, will vary with the visibility, as conditioned by the cover, bends in the trail, and whether the patrol is operating in daylight or in darkness. All members of the team must be constantly within visual distance of one another to afford mutual protection and control. At night, sound signals are used and distances reduced.

c. The limited fields of observation offered by the jungle require that reconnaissance patrols operate in close

range of the enemy in order to secure information. Skill in stealthy movement is essential.

d. Regimental and battalion commanders cause their intelligence sections to send out small patrols to secure information that immediately affects them.

e. All members of a reconnaissance patrol should be accomplished woodsmen fully acquainted with the principles of scouting.

f. All members of the patrol should have a complete knowledge of how to read maps and aerial photos. All must be equipped with and know how to use the compass. All must have machetes or jungle knives. Carabines are often preferable to rifles. Light automatic weapons are desirable. If possible, there should be at least one member of the patrol who can understand and speak the enemy language. Patrol equipment should include at least two watches and two pairs of field glasses. Leaders and assistants should carry message books and pencils.

g. All members of the patrol must know in detail just what information is to be secured, and the leader's plan for securing it. They must know where the patrol is going, time and place to which it is to return, and their own jobs.

Section VII. SPECIAL OPERATIONS

77. Ambushes

a. OFFENSIVE AMBUSHES. (1) A force which is trailbound, which tends to close up while moving, maintains inadequate security, or whose noise gives warning of its approach is particularly susceptible to ambush.

(2) The effectiveness of ambush relies upon the surprise delivery of close-range fire. The fire should come from at least two directions and should converge on the target.

(3) A part of the ambushing force may be held out as a reserve to exploit the success of the ambush and to counter the attack of near-by troops which might come to the aid of the ambushed enemy.

(4) Primary and alternate routes for rapid withdrawal of the ambushing party must be previously reconnoitered and selected because the ambush will invariably attract nearby enemy troops.

(5) Assembly points or rendezvous points for the ambushing party must be designated, so that on signal to withdraw, the men can do so rapidly and without confusion.

(6) To achieve surprise, fires of the ambush party should not commence except upon prearranged signal.

(7) If the object of the ambush is solely to inflict casualties, all firing should cease and withdrawal should commence promptly on predetermined signal.

(8) After entry into the ambush area, the path followed by the ambushing party while going into position should be carefully inspected to remove all evidence of the party's presence. If possible, the ambush area should be entered from the rear.

(9) When time and circumstances permit, antipersonnel mines should be emplaced beside the ambush area so that when the enemy seeks cover from the ambush fires, he will contact the mines.

(10) In order to cause the enemy to bunch or close up in the area of converging ambush fires, it frequently is desirable to use some form of "bait." A piece of equipment, or some unusual disturbance of the vegetation or terrain in the desired spot will frequently arouse his curiosity, and, unless he is sufficiently wary, cause him to move to the bait and thereby enter the sector of fire selected by the ambush party.

(11) In order to achieve an added degree of surprise, it might be desirable to select an ambush position which is not tactically ideal. The sacrifice of observation and field of fire might be more than compensated for by the increased surprise. It is frequently desirable to occupy the ambush position prior to daylight.

b. DEFENSE AGAINST AMBUSH. (1) The best defense against enemy ambush is skillful scouting in advance of

the unit. Native scouts and trained dogs are invaluable for this purpose.

(2) Observance of strict trail discipline is essential for defense against ambushes. Men should not

(a) Bunch up along the trail,

(b) Straggle,

(c) Talk,

(d) Lose contact, or

(e) Relax vigilance.

(3) Surprise and the convergence of fire on the ambush point is the basis of a successful ambush. Thus, although the victims may be surprised by the ambush, rapid movement for only a short distance will usually place them beyond immediate danger.

(4) The ambushing party must be enveloped promptly. Delay will result in casualties. Speed will upset the ambushing party and will save lives.

(5) A plan should be prearranged for the employment of the unit in case of ambush from any direction, and every member of the unit should be thoroughly familiar with this plan and his part in it.

78. Maneuver away from Supply Lines

a. The ideal concealment offered by the jungle facilitates deep incursions by large forces into enemy positions. Such operations have as their mission, the harassing of the enemy, attack of his rear installations, and the cutting of his lines of communication. The difficulty of transport in the jungle, however, makes supply of such forces a major problem.

b. Supply by air is one method of solving this problem. For technique of supply of ground units by air, see FM 31-40.

c. Supply by boat is another method. Not only may boats be used for supply between islands, but, in many jungle areas, streams, lagoons or other waterways are navigable by small boats and provide an easier route for supplies than overland through the jungle.

d. When supply is by boat or by air, it is essential that

the unit responsible for supply be given control of sufficient boats or airplanes to permit accomplishment of its mission. Unnecessary problems of coordination are created when a unit has the responsibility of supplying its subordinate units and must rely on a higher headquarters for the means of transporting supplies.

e. All possible details concerning supply should be planned in advance. In making such plans, every effort must be exerted to reduce to the minimum the administrative effort required of the tactical unit. The burden of administrative effort must fall on base personnel in all cases where additional work on their part will lessen the time or work of the detached tactical unit.

f. A previously prepared schedule should be established whereby, at specified times, the tactical unit will notify the supply base as to what supplies are needed, and the time and place where delivery is to be made. In general, frequent resupply in small quantities is more desirable than larger deliveries at less frequent intervals. This will reduce the weight and bulk of the supplies carried by the using troops between deliveries.

g. Supplies for a unit operating away from normal supply lines should be delivered to the unit at times and places of its own designation. As nearly as possible, supplies should be of the types and quantities requested by the receiving unit.

h. Break down into small-unit packages of mixed supplies should be accomplished at the supply base, instead of in the area of the receiving unit. So far as possible, delivery to the receiving unit should be in packages of a size and weight that can be easily handled as one-man loads. Bundles containing these smaller packages should be such that they can easily be moved by the receiving unit as three- or four-man loads to concealed areas where they may be broken open and their contents distributed.

79. Retrograde Movements

a. GENERAL. If the mission and situation do not require a defense in place, retrograde movement, partic-

ularly in the presence of an aggressive and much stronger enemy, may be the most suitable type of action, initially. Denying the enemy the use of roads, trails, and other avenues of approach, and harrying his lines of communication as he seeks to advance, may so harass, discourage, and exhaust his troops as to decrease materially their effectiveness and permit a decisive counterblow by friendly forces. Smoke may be a valuable agent for use during retrograde movements, especially in open or semi-open areas. It should be available in smoke pots and grenades. All supplies and matériel, including watercraft and vehicles, which must be abandoned are systematically destroyed to prevent their possible use by the enemy.

b. WITHDRAWAL. Cover and concealment provided by the jungle permit easy withdrawal by units in contact with the enemy. Small groups familiar with the routes over which they are to move can readily disengage themselves. Such groups, placed on trails, can deny these trails to the enemy and force him to attack on a narrow front or to cut trails around the delaying groups, thus gaining sufficient delay for the withdrawal of the main body. Withdrawal by daylight in jungle areas has many of the advantages of night withdrawal (concealment and cover) in more open terrain, and permits a greater degree of control. However, personnel and equipment moving on wide trails easily observed from the air offer favorable targets to hostile combat aviation. (See FM 100-5.)

80. Delaying Action

a. In dense jungle areas, delaying action will be executed principally on and near trails. In areas of lesser density, delaying action will frequently require the occupation and defense of one or more delaying positions, since in these areas combat in the jungle will have generally the characteristics of woods fighting, and a defensive position will be necessary to assure effective delay. The

flanks of such a position must be protected against envelopment by the enemy.

b. Small, determined groups can delay forces many times their size; however, this type of combat in jungle areas is especially tiring. Consequently, units should be divided into groups which may alternate in the occupation of delaying positions and thus secure rest, while the enemy is kept constantly engaged. Such groups should consist of eight to ten men, two of whom are armed with automatic rifles. If possible, artillery observers should remain with the delaying force to adjust fire on the pursuing enemy.

c. Delaying groups, in addition to their normal equipment, should carry axes, mines, and explosives for effecting demolitions. Obstacles must be covered by fire if they are to be of value. In order to cause the maximum delay, particularly of vehicles, bridges should be destroyed and trees and other obstacles placed across all trails and roads as far forward from the delaying position as time and the situation will permit. Mines should be placed in the jungle on both sides of obstacles, and in the obstacles themselves, to make the removal of the obstacles hazardous. Booby traps are especially suitable for this purpose. (See FM 5-30 and FM 5-31.) At points where the jungle is thin and is not an obstacle to the movement of foot troops, mines may also be employed. As many obstacles should be constructed along the front of a delaying position as time allows. Every effort should be made to place them so that the enemy will tend to filter into areas where the delaying force can place the most fire power.

d. Because of the difficulties of supply and coordination, small, well-trained forces, energetically led, are most suitable for the execution of delay in the jungle. Supports should be available in rear of leading elements along each trail. They may be used to extricate the leading elements from serious combat, to patrol the trails to prevent the leading elements from being cut off, and to replace them if they are captured. (See FM 100-5.)

Section VIII. SUPPLY

81. Importance and Special Conditions

a. The importance of supply and the special conditions affecting it in jungle warfare will limit and may determine the extent of operations, rates of movement, and the strength of forces employed. Available trails or roads, waterways, density of natural growth, season, and general terrain conditions will all have a direct bearing on the several types of transportation, and therefore upon the functioning of supply. Requirements must be anticipated well in advance of actual needs. Careful planning is necessary to conserve transportation facilities, and supplies of all classes must be closely supervised in order to exclude surplus and nonessential items.

b. Unit supply officers must be unusually aggressive and ingenious. They must be experts in advance planning and in forecasting needs. Replenishments must be requisitioned well in advance. Reconnaissance of supply routes and watering points must be continuous. Alternate routes and points must be located and developed.

c. Since the jungle ordinarily affords concealment from air observation, and since the protection of convoys against ambush is more readily effected during daylight, commanders should take maximum advantage of daylight hours for the movement of supplies.

d. Special provision must be made to protect supplies from spoilage caused by climatic conditions. Tentage, tarpaulins, or thatched shelters are necessary to provide protection from heavy rains and hot, tropical sunshine.

82. Transportation

a. The basic means of jungle transport is hand-carry, although pack animals are frequently employed. Pack units have the disadvantage that forage for their animals must necessarily make up a large part of their load, because the natural jungle growth is not satisfactory forage for most domesticated animals. Native pack animals and handlers may be used when available, generally to

supplement organic means. Uncertainty as to the limitations, and particularly as to the dependability, of this means must be carefully considered. However, the employment of native labor and animals, if practicable, will conserve combat efficiency.

b. Air transportation is considered an important factor in the supply of jungle operations. It may be used for air dropping of supplies either by parachute or free dropping, or by the landing of supply planes. Emergency supplies can be flown to units when all other means of supply fail. Artillery liaison type planes have been employed with complete success in supplying isolated patrols and small units. Where suitable water areas are available, amphibian planes may be employed to transport supplies.

c. Water-borne transportation is the most economical and often the surest means of supply. Streams, lagoons, and other waterways should be used to the maximum extent possible. Supplies transported over waterways are less susceptible to loss or damage, fragile containers are safer, and the destruction caused by insects is largely avoided. Boats, canoes, and rafts are to be employed at every opportunity. Where practicable, distributing points should be established along waterways to save transportation by men, animals, and vehicles.

d. Wheeled transportation is generally impracticable except on roads, or in the dry seasons on wide trails, and in areas where the jungle growth is light and free of intertwined vines and large trees. However, engineer and pioneer troops frequently can improve trails sufficiently to permit movement of $\frac{1}{4}$ -ton trucks and trailers in areas close to the combat echelon. Track laying vehicles are generally reliable in jungle operations and furnish one of the principal means of logistic support.

83. Rations

Rations will necessarily consist mainly of nonperishable items: canned meats, vegetables and fruit; bacon; dried vegetables and fruits; and candy. Rice and hominy may be substituted for potatoes. Fragile containers should be

reduced to the minimum to avoid loss due to insects, damage, and breakage. To supply small reconnaissance or security detachments, small tin containers are desirable. It may often be advisable to distribute unit rations, such as the 5-in-1 or 10-in-1, so that meals can be prepared by squads or individuals. The supply of food in small (preferably individual) containers is of particular importance where lack of facilities precludes sterilization of mess equipment. Field rations C, K, and D are suitable for use in the jungle (see also pars. 34 and 35).

84. Ammunition Supply

Ammunition supply will become progressively more difficult in moving situations, especially where there are no waterways. As is true of other supplies, ammunition must eventually be carried by hand before it is distributed. Therefore, a break-down to loads of 40 to 60 pounds, and, in some cases, further break-down, will be necessary.

85. Water Containers

Five-gallon water containers will be required to carry water where conditions make it necessary to supply units at a distance from streams. When man-carry is necessary, these are carried on packboards. Frequently, it may be desirable for troops to be equipped with two canteens per man.

86. Local Purchases

Local purchases to supplement the limited diet of a field ration are useful in inhabited areas. Fresh food, particularly fish, fruit, and vegetables, are frequently available. Supply and mess officers should be prepared to make such purchases for cash, provided the necessary sanitary inspections have been made by authorized medical personnel. The importance of proper medical inspection of such supplies cannot be overemphasized.

87. Clothing

Since clothing, particularly shoes and socks, deteriorates more rapidly in tropical jungle areas than in more tem-

perate climates, special provision must be made for adequate resupply. Companies and similar units should carry a limited emergency supply of assorted sizes of shoes and socks. Rear echelons and base units also must carry larger stocks than in temperate climates.

88. Engineer Supplies

Engineer supplies, such as cutting tools, barbed wire, and demolitions, should be available on call. It may be necessary to place these supplies so far forward that there will be a risk of loss, but the weight and extreme difficulty of transporting engineer materials make it imperative that they be moved by pack, vehicle or boat into or near areas where they are to be employed.

Section IX. EVACUATION

89. General

a. The usual equipment and property prescribed by Tables of Organization and Equipment for units concerned with evacuation are not always suitable for operation under jungle conditions. Standard cross-country ambulances are seldom practicable on jungle trails, in swamps, and on unimproved muddy roads rutted by heavier vehicles. For this reason, other types of vehicles, particularly weapon carriers and $\frac{1}{4}$ -ton trucks, may be used for transportation of the wounded. Any and all types of transportation, whether by water or land, are to be used for transporting casualties to the rear. This principle applies not only to vehicles assigned primarily for this purpose, but also as a routine measure in the case of an empty supply vehicle returning from forward positions. Evacuations in the jungle should normally be along supply routes which are adequately protected against enemy action. Boats, rafts, and ambulance barges are used when practicable. Where open terrain or water permits landing and take off, airplanes provide an excellent and rapid means of evacuation.

b. The ordinary litter does not suffice in evacuating across streams, gullies, or down precipitous cliffs. Metal

basket litters (Stokes) are more practicable under these conditions and can also be used to advantage on improvised racks installed on $\frac{1}{4}$ -ton trucks and trailers. Improvised litters of salvaged canvas or cot covers are invaluable in situations where weight becomes a vital element.

c. One frequent error is to overestimate the ability of litter squads. It has been found that well conditioned men, carrying a patient in a litter for 400 to 600 yards, over jungle terrain, are unable to repeat the performance without appreciable rest. Surgeons must keep their commanders informed of the adequacy of organic litter bearers in each operation, and commanders must detail additional litter squads as needed. Natives often can be advantageously employed to assist in evacuation. A sitting patient can be carried pick-a-back in a sling for great distances by some native porters.

d. No one method of evacuation will suffice. It is rather by a combination of the means available that the collection and transportation of the sick and wounded will be accomplished satisfactorily. For the general methods and means of transportation of sick and wounded see FM 8-35.

Section X. COMMUNICATION

90. General

a. Methods of communication used in jungle warfare include radio, field telephones, sound-powered telephones, messengers, pigeons, dogs, whistles, voice, pyrotechnics, flags, prearranged messages, and improvised signals such as beating two sticks together or tapping on rifle stocks.

b. Communication instruments should be moisture-proofed and fungus-proofed.

c. Dry batteries of all types have a much shorter life, even when not in use, in jungle climates. At least twice the usual initial supply is necessary. Frequently, ad-

ditional personnel must be detailed to carry this extra equipment.

d. Communication personnel must be as well-conditioned physically as other front-line troops, and must have ready knowledge of the use of all rifle company weapons.

91. Radio

Radio range in the jungle is reduced from 40 to 70 percent below what is considered normal in open or lightly wooded terrain. Radio personnel must specialize in getting the traffic through with weak signals under poor atmospheric conditions, rather than on speed of transmittal. They must be trained in the proper siting of antennas to obtain the maximum possible range from their sets. Radio communication will be particularly difficult at night, and special emphasis must be placed in training to insure getting messages through during this period. The use of small radio sets will be greatly restricted because of the severe reduction in range. Their effectiveness depends to a great extent on their location. Dense undergrowth and precipitous slopes have a screening effect. Special training is necessary to teach operating personnel where to establish their sets and antennas to reduce to the minimum the screening effects of jungle terrain and vegetation.

92. Telephones

a. The field telephone is the most satisfactory means of communication in the defense. In a fast moving attack, or a deep enveloping or circulating movement, wire teams will frequently have difficulty in keeping up. If the attack is progressing, it should never be held up to allow wire teams to catch up; but wire teams must move with attacking echelons as far forward as possible to allow prompt communication to the rear (see *b* below). In the defense, all wire lines should be paralleled. Initially, wire is laid on the ground; later when time permits, it should be tied in the trees or buried. As a general rule,

wire should not be laid or strung along trails. It should be laid or strung several feet to one side of the trail. Frequent rains and constant dampness have a considerable effect on the talking range of field wire lines, particularly those of light assault wire. To insure continuous operation, provision must be made to use ground-return circuits. Because conversations over ground-return circuits may be easily intercepted by the enemy, prearranged codes or ciphers should be used, and the ground-return circuits supervised in the same way as voice-radio sets. Because of difficulties of supply and transport, light assault wire is usually used instead of heavy wire, and relay stations may be necessary in order to maintain suitable wire communication over long lines. It must be emphasized that a moving attack will under no circumstances be held up for the installation of wire. If wire is laid, it is the responsibility of communication personnel to lay it as rapidly as possible.

b. Sound-powered telephones are valuable. They are reliable, light, and easy to handle. When used with assault wire, they can be employed for communication from assault companies to the rear. They are especially useful to connect observation posts with command posts and in controlling mortar fire. They may also be used by reconnaissance patrols working forward of friendly lines, and for infantry-tank communication. If a sufficient number are available, they will prove valuable for use within command posts at night, since their use will help to reduce movement within the command post to a minimum. In the defense, each front-line platoon should be provided with a sound-powered telephone.

93. Messengers

a. In battalions, companies and platoons, messengers are the primary means of communication both within moving columns and in the attack. In the defense, they supplement wire means. Messengers should be picked men, selected for their reliability, intelligence, stamina, courage, and initiative. In addition to the regularly de-

tailed messengers, other personnel must be trained so that they can replace messengers who are casualties or temporarily noneffective because of exhaustion. There is no substitute for good messengers.

b. All messengers should be skilled scouts and good shots. They must be able to read maps and air photos, and to make sketches and overlays. They must be alert and observant.

94. Pigeons

Trained homing pigeons, properly used, are a reliable means of communication. Fog, rain, snow, and darkness decrease the efficiency of the birds. A trained homing pigeon will return to its loft from a distant point carrying any light weight message which has been properly attached to it at an average speed in excess of 37 miles per hour. Pigeons are suitable for use in the jungle.

95. Dogs

Dogs have been satisfactorily used in jungle operations both as scouts and as messengers. Trained dogs have proved their value under conditions of actual combat. It is anticipated that dogs will be commonly used in the future. Undertrained dogs, or dogs for whom no handlers are available, should never be taken on a jungle operation.

96. Whistles

Whistle signals may be used in the jungle. Most frequently they are used to indicate that unidentified or enemy planes are approaching or are overhead, or that all is clear.

97. Voice

Communication by voice is frequently satisfactory in platoons and squads either in attack or defense, although as in all operations its practicability is largely contingent upon the degree of battle noises. In all training, the necessity for "passing the word" correctly must be

stressed. In large units, voice communication during movement is unsatisfactory.

98. Pyrotechnics

There is an almost unlimited field for the application of pyrotechnics as a means of signal communication. Pyrotechnic codes are set up in signal operation instructions and in orders for all operations. They may be used to call for fires; to announce the jump-off of an attack or the capture of an objective; to call boats in; to indicate general locations at which air drops of supplies are to be made, or to indicate certain types of enemy movement or activity. As a means of authentication, several pyrotechnic signals may be fired with a specified interval between signals. Similarly, color sequence can serve for authentication. Smoke containers may be placed in tree tops or on high ground for purposes of greater visibility (see also par. 53a.).

99. Signal Flags

While of little use in the jungle itself, improvised signal flags may be used for signaling along beaches or from shore to ship.

100. Prearranged Improvised Signals

a. Small patrols should always plan to use prearranged signals. Sound signals should be carefully selected to insure that they simulate sounds natural to the particular regions. Prearranged signals will indicate simple commands such as "Halt," "Down," "Danger," "Forward," or "All Clear." Patrols should carefully rehearse such signals before their departure.

b. Sound and visual signals should not be used during darkness because they reveal positions. String connecting adjacent foxholes may be used to effect reliefs at night, and to relay warnings. This is done by a prearranged series of tugs on the string, each end of which is attached to an individual.

Appendix I

NATIVE PLANTS

1. General

Wild fruits, nuts, and edible plants exist in great number and variety throughout jungle areas. Personnel operating in such areas should make every effort to learn to identify these, as well as the relatively few poisonous ones. This may be done by making field trips, talking to natives, and visiting botanical gardens and museums (see pars. 4 and 7).

2. Poisonous Plants

a. GENERAL. Poisonous plants are of three kinds: those whose fruit, nuts or portions of the plant itself are poisonous if eaten, for example, the physic nut (see fig. 11); those whose juice is a contact poison; and those which produce a mechanical "poison" or sting. A plant which is particularly dangerous if the juice enters the blood stream is strychnos (see fig. 12) from which the deadly curare poison is extracted by certain primitive peoples of tropical America. Methods of distinguishing poisonous fruits and nuts from the nonpoisonous are described in paragraphs 4, 6, and 7.

b. CONTACT POISONS. If a man has become exposed to a plant whose juice is a contact poison, he should promptly wash the exposed parts of his body with water and issue soap. Local inhabitants can often furnish information making it possible to identify plants which are dangerous or annoying in this respect. An example is the manzanillo, found in tropical America and illustrated in figure 13.



Figure 11. Physic nut. A shrub common in hedges throughout the southwest Pacific area. The large seeds are violently poisonous, and should not be eaten under any circumstances.

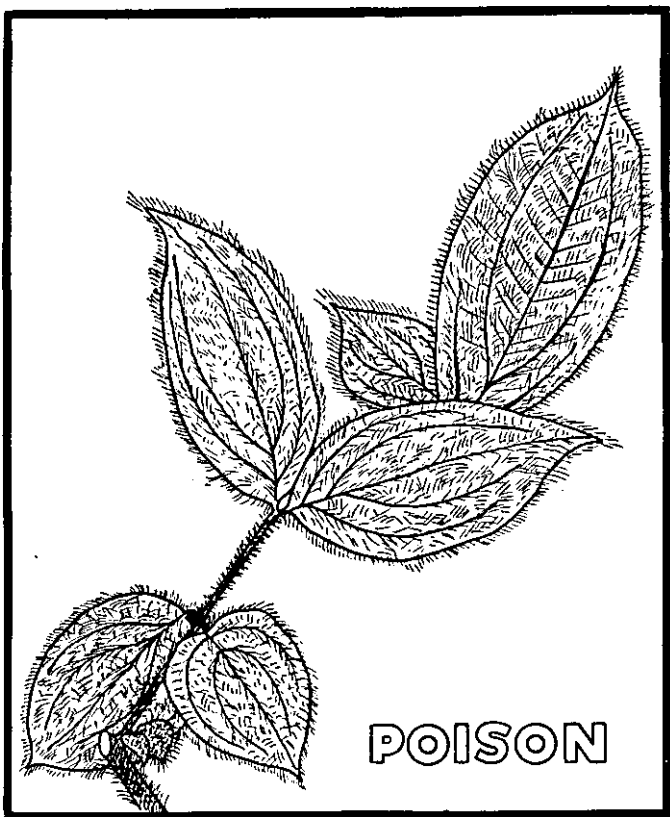


Figure 12. *Strychnos*. A slender, woody vine, easily recognizable by the small hairs on all parts. The fruit is shaped like a ball, and usually is 2 inches or more in diameter, with a hard green or yellow skin. It holds several large seeds. In some parts of Brazil it is called "Urari." The bark and roots are a source of "curare" one of the deadliest poisons known. A small quantity in the blood stream will paralyze the nerves almost instantly, and soon cause death. It has been used by the South American Indians for poisoning arrows and the darts from blow guns. It is reported that similar use of the plant is made by the Indians of Panama.

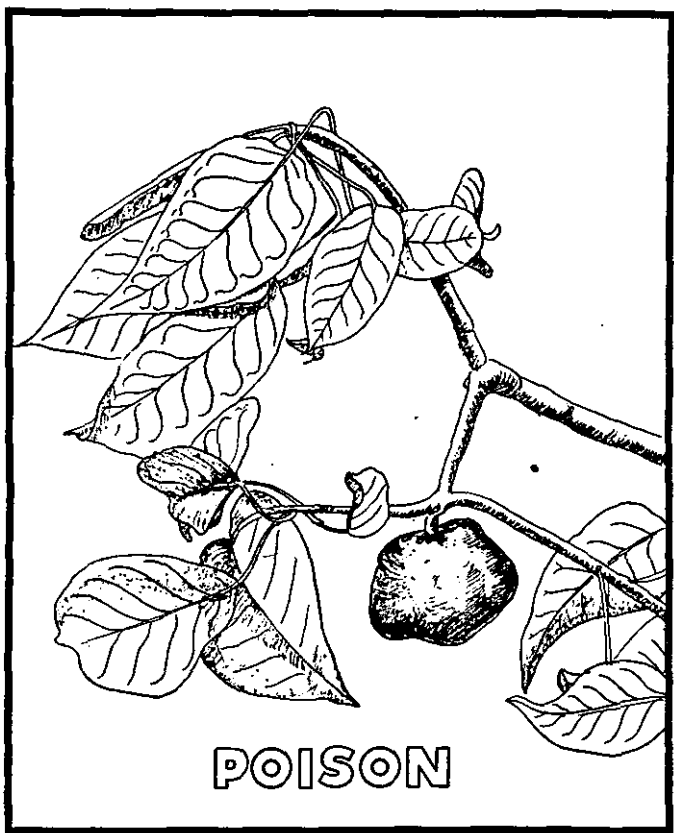


Figure 13. Manzanillo. A small tree common on seashores in many parts of tropical America, and abundant on both coasts of Panama, where it forms dense thickets along the beaches. The bark is smooth and pale brown; the leaves are small, smooth and green. The flowers are green, and are arranged in stiff spikes. The fruit is over an inch in diameter, and resembles a small green apple. The fruit is poisonous. The milky sap is highly irritating, like the juice of poison ivy. Smoke from the burning wood may cause irritation to the eyes.

c. **STINGING PLANTS.** Certain types of plants with stinging hairs on their surfaces produce a mechanical irritant, frequently highly painful and in certain cases, if the hairs are taken into the intestinal tract or mucous membranes, dangerous. Examples are the cowitch and the nettle. One variety of the latter found in tropical America is the ortiga (see fig. 14).

3. Native Use of Plants

In all parts of the region the inhabitants in general know both the wild and the cultivated plants which may be used as food. However, the use of a certain species of plant as food may be common in one area, but quite uncommon in other areas. For example, the breadfruit, which is a basic food in many parts of Polynesia, is little used as food in most parts of Malaya, where the species also occurs, simply because better foods are usually available there.

4. Advice of Natives

Whenever possible, one should try to get in touch with natives even though one may be able to talk with them only by means of signs. They can be most helpful in times when regular rations are not available. They usually know how these emergency food plants should be prepared, and which may be poisonous if eaten raw. In some of the actually poisonous plants, the poisonous elements may be eliminated by proper cooking or by other treatment after which the material may be eaten with safety.

5. Local Names

In jungle areas, there are many different languages and dialects used. For all plants of this vast region there are probably in excess of 50,000 native plant names actually recorded; many locally used plant names are still unlisted. Some native plant names are very widely used, while others are local. Many of the plants have no English names.

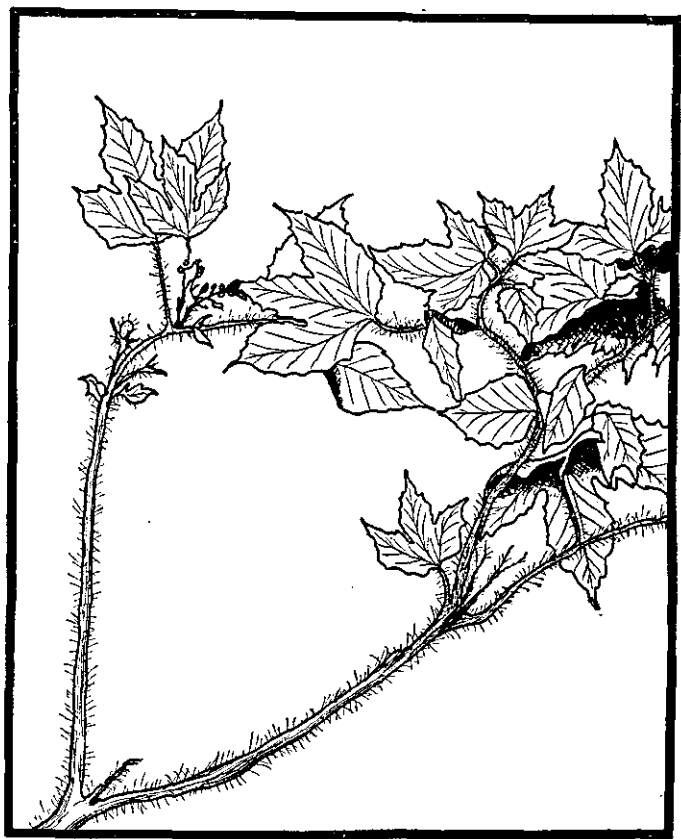


Figure 14. Nettle. (*Ortiga* in Spanish). The nettle is found in many parts of the world. That variety known in Spanish as the *ortiga*, is common on the Pacific slope of Papama, particularly in dry regions along the beaches. It grows about 3 to 5 feet high. It is covered with stiff hairs which, when they sting the flesh, cause great pain which often lasts for a day or longer, and is sometimes accompanied by high fever. The flowers are white, and about $\frac{1}{2}$ inch in diameter.

6. Guide for Eating Fruits

Cultivated trees and shrubs growing in and near the settled areas and bearing attractive fleshy fruits, for the most part are actually planted for their fruits, which generally may be eaten with perfect safety. In the wild, where monkeys occur, a general safeguard to follow is to observe what the monkeys actually eat in the form of wild fruits. The feeding habits of birds is not such a safe guide. One should keep in mind constantly that fruit maturity in the tropics is normally seasonal, just as it is in temperate regions, and only occasionally, as with the coconut palm, are fruits produced throughout the year.

7. Edible Plants

a. For a detailed study of edible plants, see TM 10-420.

b. The food plants described and illustrated in the pages which follow were selected on the basis of their abundance and their simplicity of preparation for eating, as well as the comparative ease with which they may be recognized. Many others exist, some of them as widespread as the examples shown. Soldiers should make every effort to learn first-hand of edible plants in the particular locality where they are stationed. Positive identification can be learned only by first-hand knowledge of the plants. Study in botanical gardens and museums will help. Field trips, preferably under the guidance of informed friendly native inhabitants, are the best means of learning plant identification.

c. In addition to the edible plants listed herein, many of the familiar garden vegetables such as cabbage, beets, corn, beans, squash, cucumber, and egg plant are cultivated by natives. Fruits such as bananas, pineapples, lemons, oranges, and limes are also found. These are not shown on the following pages because of the average man's familiarity with their appearance. It must be remembered that cultivated fruits and vegetables belong

to some native inhabitant, and must not be picked except by permission of the owner. Few natives would object to an individual soldier's picking a small quantity of his crop, particularly if the soldier is separated from his unit and is obviously taking the food as an emergency measure. However, the presence of cultivated plants is an indication of nearby habitation where food, shelter, medical aid, and assistance in regaining contact with one's unit can usually be obtained, and it might be more desirable to find the nearby native village early, rather than to stop and eat from a man's garden.

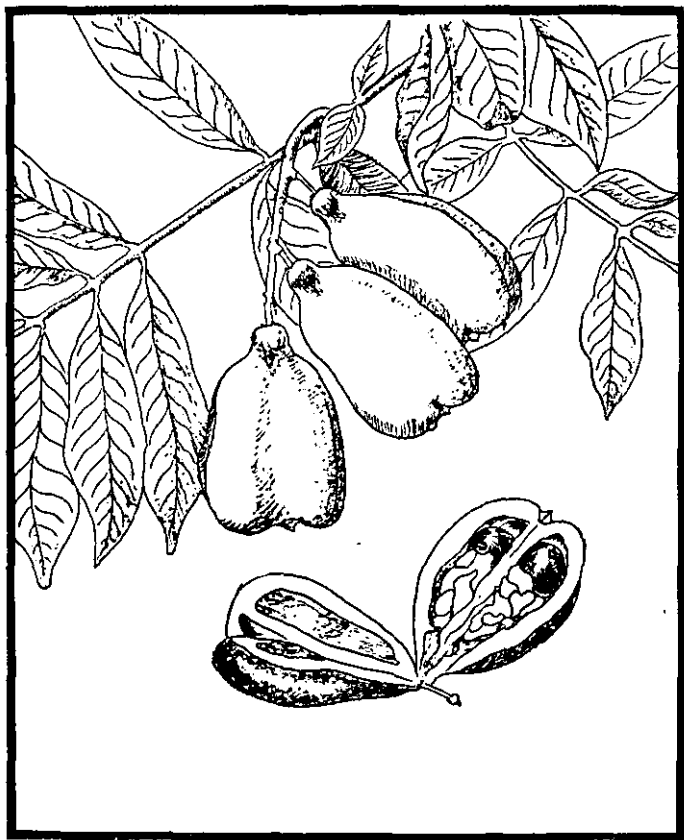


Figure 15. Akee (Huevo vegetal in Spanish). A small tree with double leaves. The fruit has three cells, and is colored red or orange. It contains three large black shiny seeds each seated in a white center. The center is the edible part of the fruit. It is usually boiled in salt water, and then fried, but can be eaten raw. The SEEDS and the UNRIPE FRUIT which has not opened by itself on the tree, are POISONOUS.

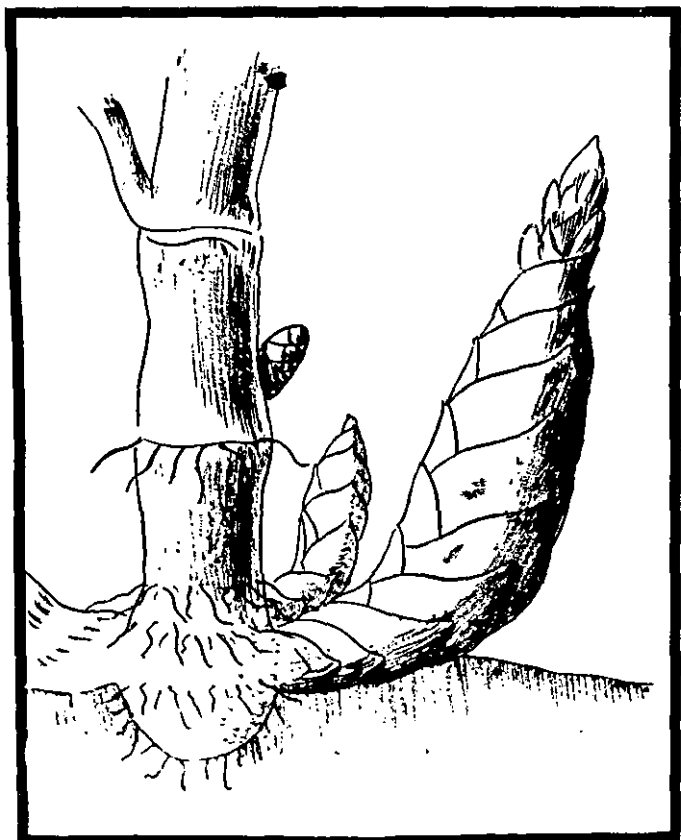


Figure 16. Bamboo shoot. Bamboo, familiar to almost everyone, is found throughout tropical Asia and the Pacific Islands. The young shoots, up to a foot or so in height, can be eaten raw, but are much more palatable when cooked. In addition to use as food, bamboo provides material for the construction of many expedient tools and receptacles.

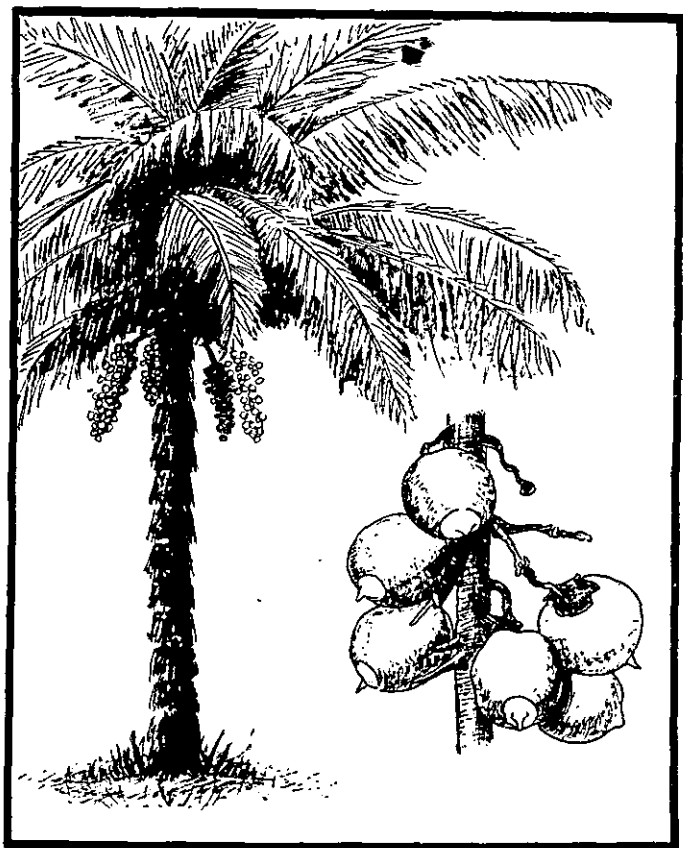


Figure 17. Black palm. A tree with very hard black wood. The meat around the orange or red fruits is sweet, and although stringy can be eaten (raw only).

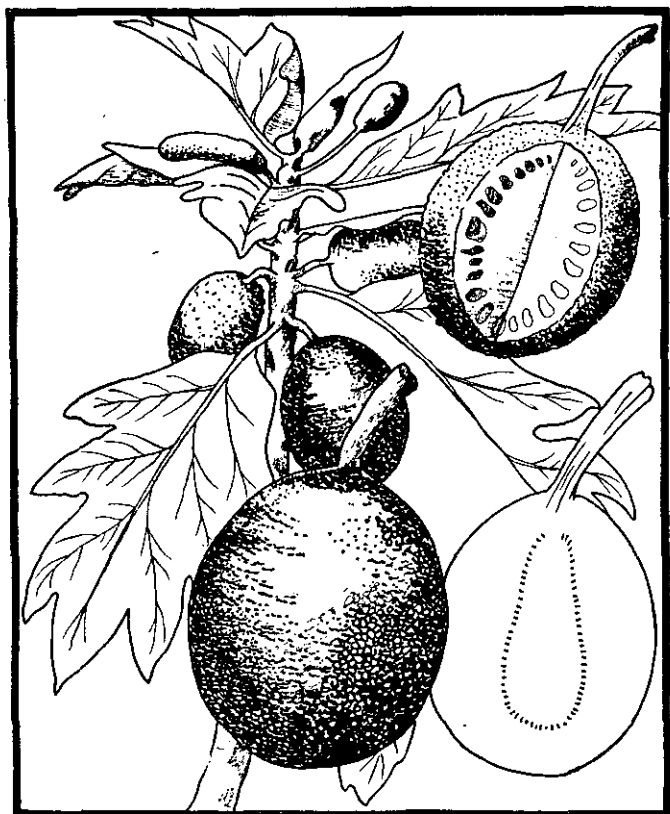


Figure 18. Breadfruit (*Fruita de Pan* in Spanish). A large tree 20 to 40 feet high, a native of the East Indies, and now found throughout Polynesia, as well as in the West Indies and Panama. The leaves are large, sharply lobed, dark, and glossy, and have a sticky, milky juice. The fruit is from 6 to 10 inches in diameter, round or oval in shape, and has a rough, yellowish green surface. It may be eaten when thoroughly cooked by baking, and although extremely dry is a good substitute for potatoes.

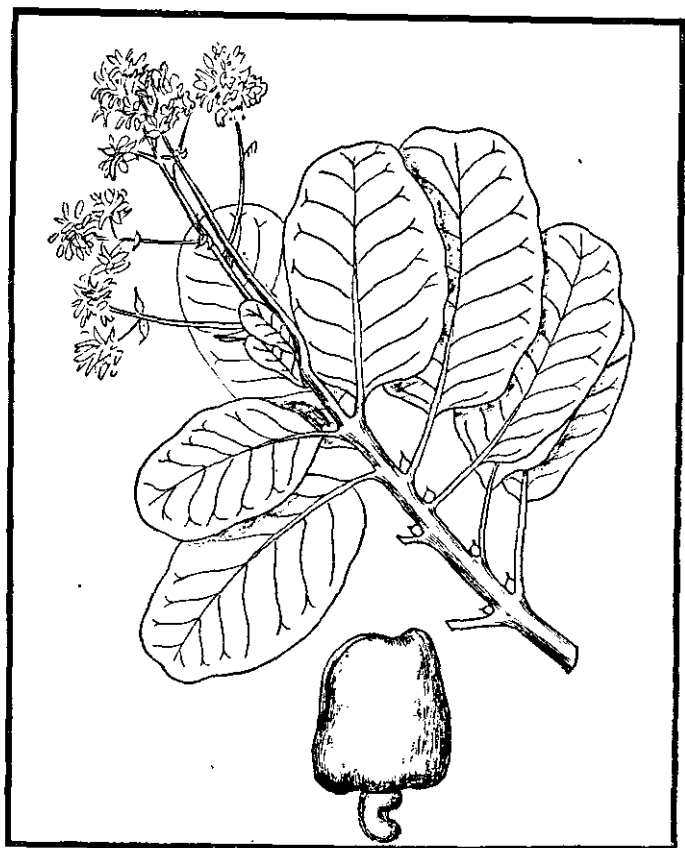


Figure 19. Cashew (*Maranon* in Spanish). A tree growing as high as 30 feet, found in fields and on the sides of high bushy hills in Central America. The leaves are leathery, and are yellowish-green in color; the flowers are pink. The fruit consists of a large grayish, kidney-shaped nut hanging from a red or yellow, spongy juicy mass about the size and shape of a pepper. The pepper-shaped mass can be eaten raw. The nut can be eaten after it has been roasted until all the oil evaporates; otherwise it is poisonous. The oil in the nut should not be touched with the bare hands, as it irritates the skin, and causes swelling.

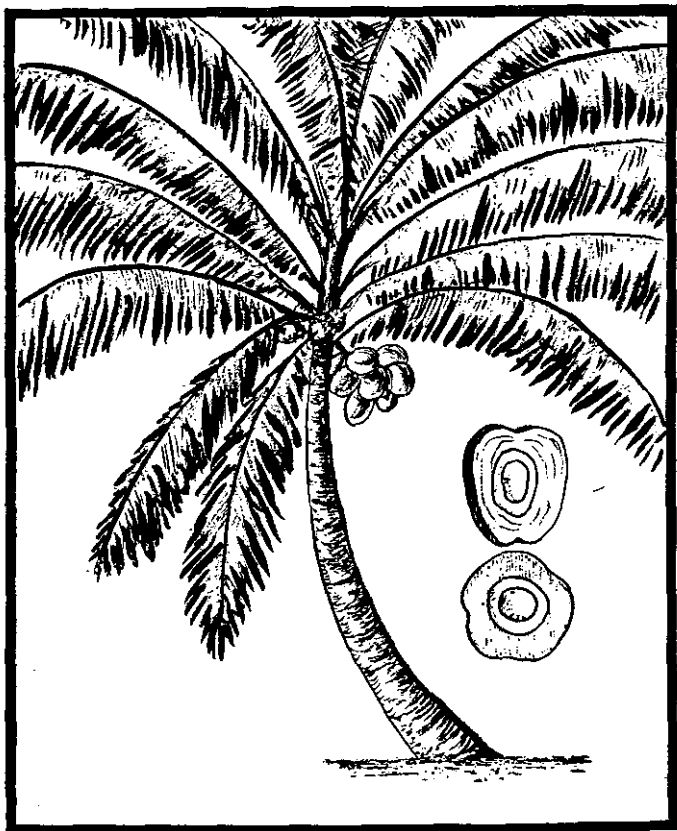


Figure 20. Coconut (Coco or Cocotero in Spanish). The coconut, found in tropical regions throughout the world, usually grows in flat areas along the banks of streams or on the coast. The tree grows as high as 100 feet, with large green or brownish fronds often 20 feet long. The nuts grow in clusters at the base of the fronds. The meat of both green and ripe nuts is edible, although that of the former is by far the more digestible. The water or "milk" of the green nut is very palatable, and is frequently a satisfactory substitute for water. In order to extract the water or meat of the nut, the large outer husk must either be stripped or cut away. A stout stake with a sharp point, buried in the ground at an angle is useful in husking.



Figure 21. Grape. Wild grapes are, in general, confined to the temperate zone, however there is one which is native to Central America and is known as the Uva or Bejuco de Agua. This variety is common in thickets about Panama. The fruit is very small and sour, but the stem contains a large amount of sap which is a safe substitute for water.

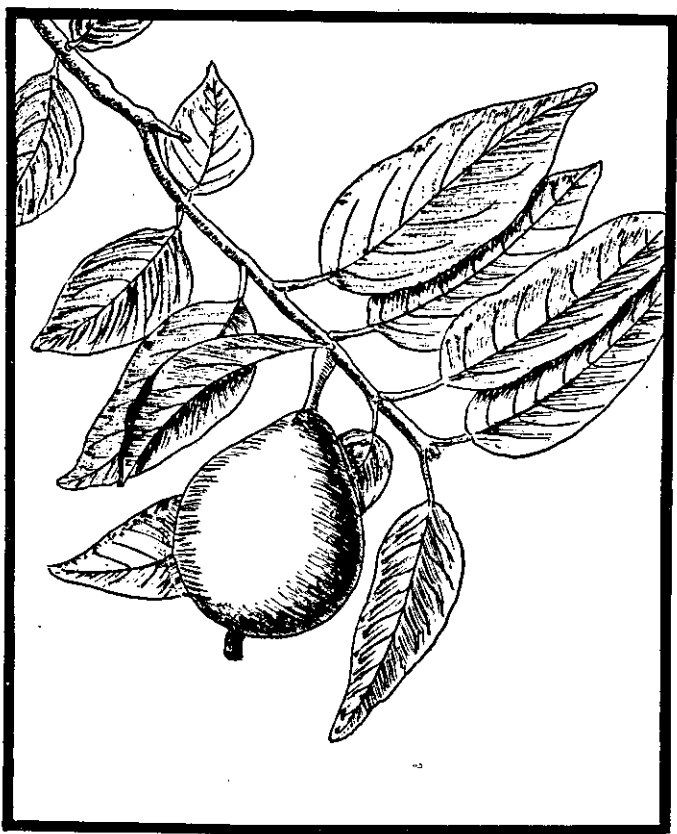


Figure 22. Guava. A native of tropical America, now widely distributed throughout Malaysia and Polynesia, particularly in open areas. The tree is from 6 to 20 feet high, and has short stalked leaves with strongly marked veins, and covered with a soft down. The fruit is pear shaped, about the size of a hen's egg, and covered with a thin bright yellow skin filled with a many-seeded soft pulp. This last is yellow, pink, or red in color, has a pleasant sweet-acid aromatic flavor, and is eaten raw. Jelly and paste are made from the boiled fruit.

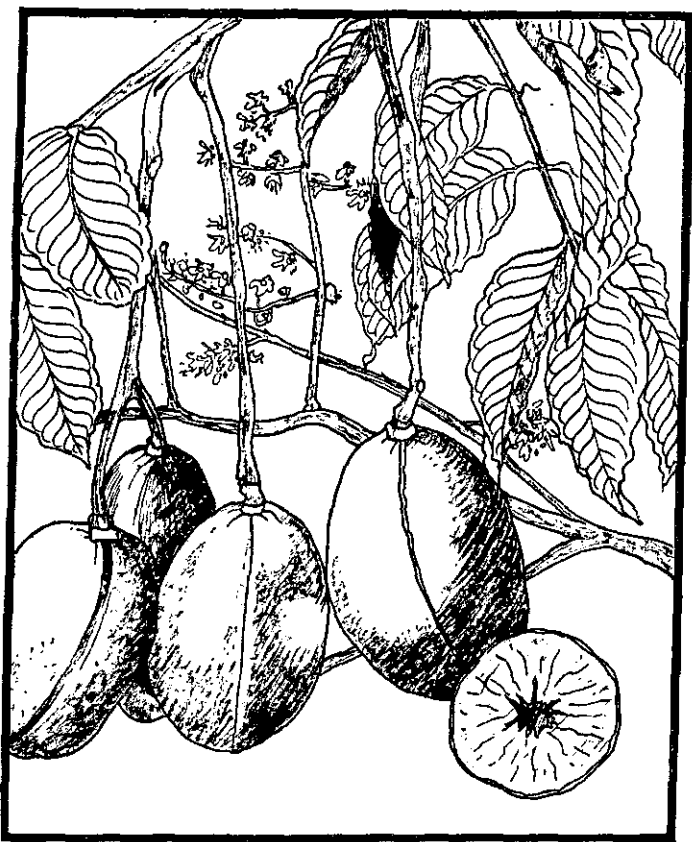


Figure 23. Hog plum (*Circuelo* in Spanish). A small tree, very common in Panama, both in open fields or on bushy hillsides. The fruit, which can be eaten raw or cooked, resembles a plum, and is usually red or orange.

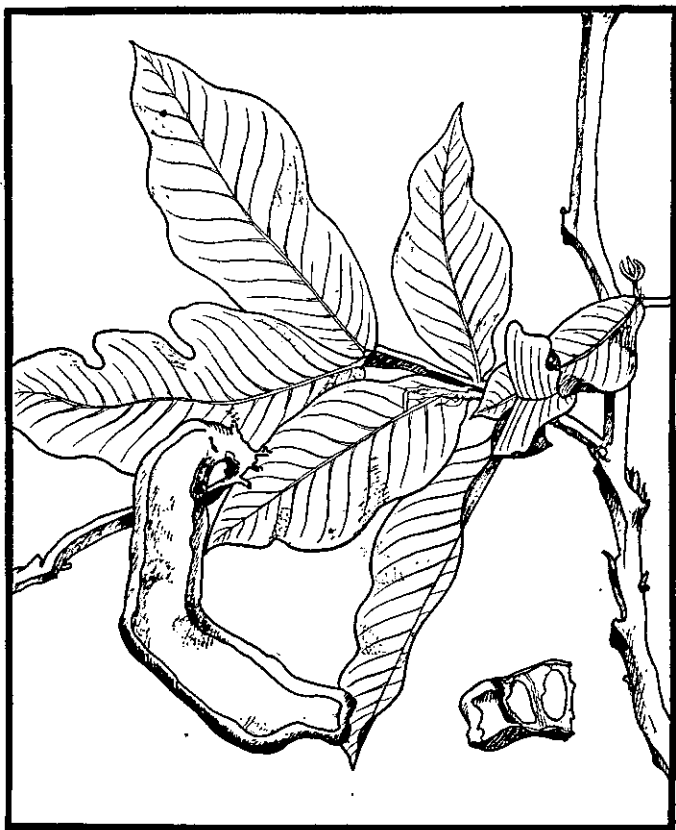


Figure 24. Ice cream bean (also called Guava in Panama). A tree common in Central America. The leaves are hairy, dark green on top, and light green underneath. The fruit, which can be eaten raw only, looks like a bean, and has a thick, sweet, juicy pulp, containing seeds.

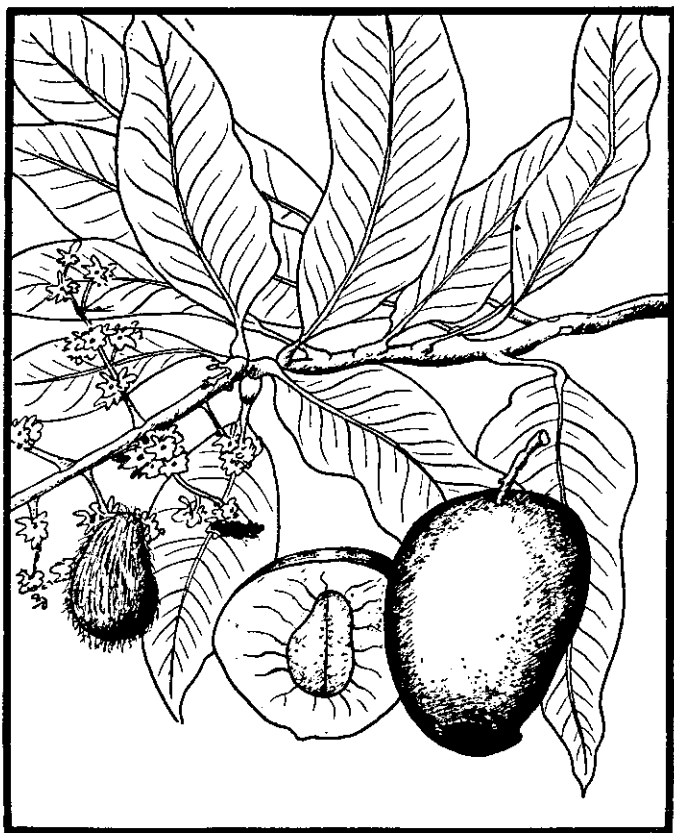


Figure 25. Mango. The mango is common in Malaysia, Polynesia, and tropical America, usually in a cultivated state, although a few wild ones may be found. The tree is usually large and spreading, with smooth, dark green glossy leaves. The fruit is 2 to 6 inches long, and is green, yellow or orange red when ripe, according to the variety. Some mangoes have a strong turpentine taste, but are safe to eat. If not peeled before being eaten, the juice of the skin, particularly at the base of the stem, may cause a skin rash, particularly around the mouth, which develops into "mango sores." The sap of some of the wild species of mango trees found in Malaya, all with edible fruit, has a very irritating effect upon the skin, like that of poison ivy. Mangoes are generally eaten raw, but may be cooked.

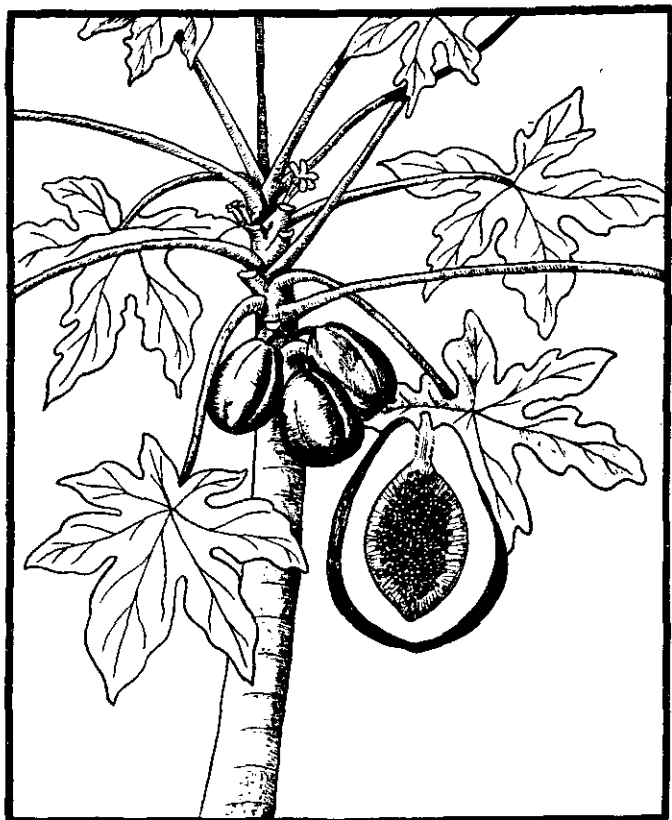


Figure 26. *Papaya*. Found throughout the Pacific Islands and in Panama. The tree has a single straight, grayish trunk from 6 to 20 feet high, with a cluster of long-stalked uneven-edged leaves at the top. The trunk is pulpy and brittle, and can be cut through with one or two blows of a machete. The fruit resembles a muskmelon in appearance, is green or yellow when ripe, and contains many black shot-like seeds in the interior cavity. The skin of the fruit and the tree itself exude a milky sap which may cause skin irritation. Ripe papayas are eaten raw, but green ones should be cooked by boiling. The sap will make meat tender if placed on it before cooking, or in the water if the meat is being boiled.



Figure 27. Polynesian chestnut. A small to medium-sized tree found in Polynesia, and as a larger tree in Malaysia and tropical Asia. The nuts, which are eaten either boiled or roasted, grow in large pods, each containing a single seed or nut. They are well-flavored and highly nutritious.

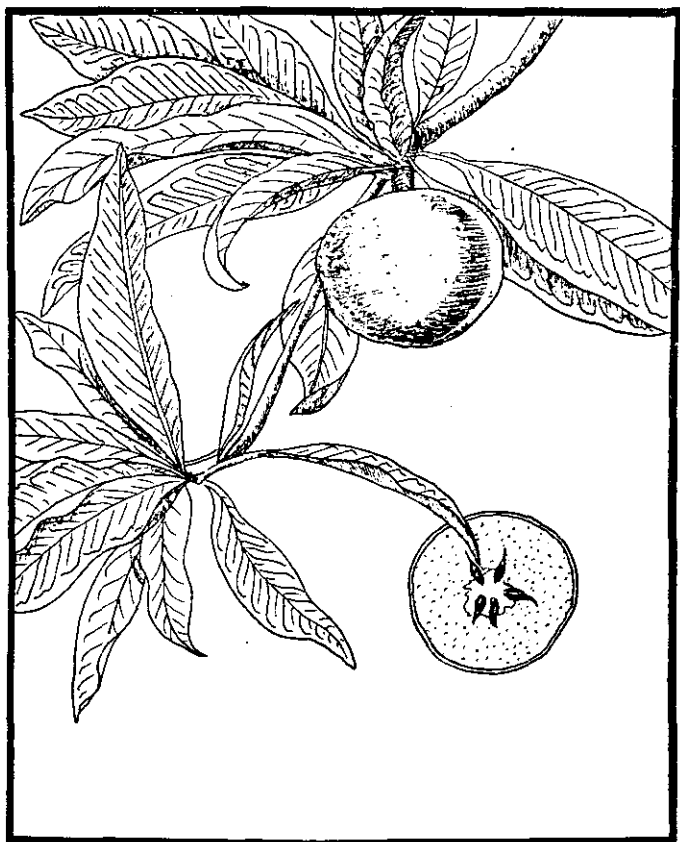


Figure 28. *Sapodilla* or *Nispero*. A large tree, growing as high as 60 feet, found in tropical America. The leaves are shiny and dark green. The fruit, about 2 inches in diameter, is ball-shaped, with thin brown skin which may be either scaly or smooth. It is eaten raw only.



Figure 29. Sour sop (Guanabana in Spanish). A small tree of tropical America, with smooth, dark-green leaves which are strongly scented when crushed. The spiny fruits are often as large as a man's head, and weigh up to 10 or 12 pounds. The juicy white pulp, crushed and with water added, makes a palatable beverage. This pulp can also be eaten raw.

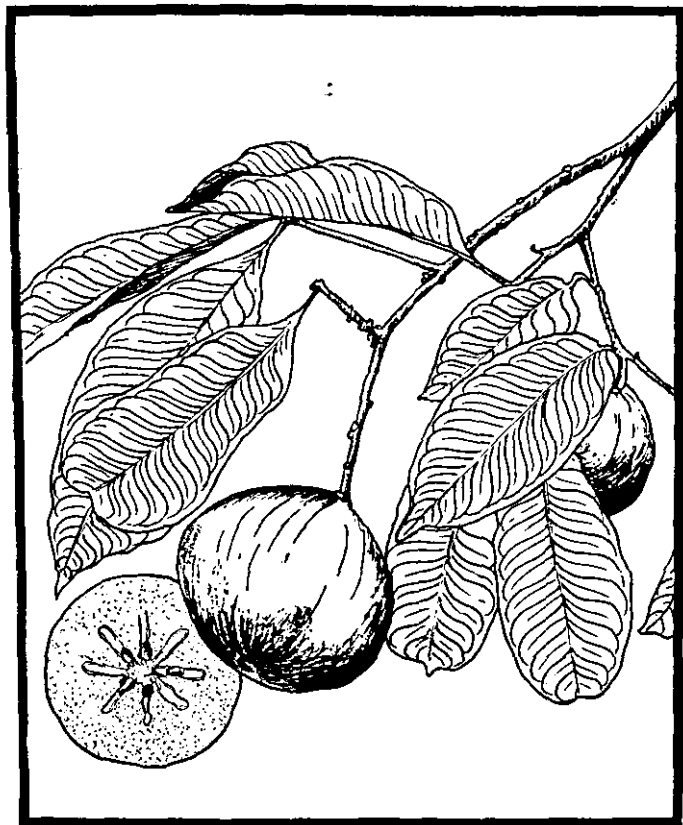


Figure 30. Star apple (Caimito in Spanish). A common tropical American forest tree which grows as high as 60 feet. The leaves are dark green on top, and have shiny silky brown hairs on the bottom. The fruit, which has a smooth green or purple skin, resembles a small apple in appearance. The fruit, which has a sweet, greenish milky meat, is eaten raw only. When the fruit is cross cut through the center, the brown seeds make a star-shaped figure.

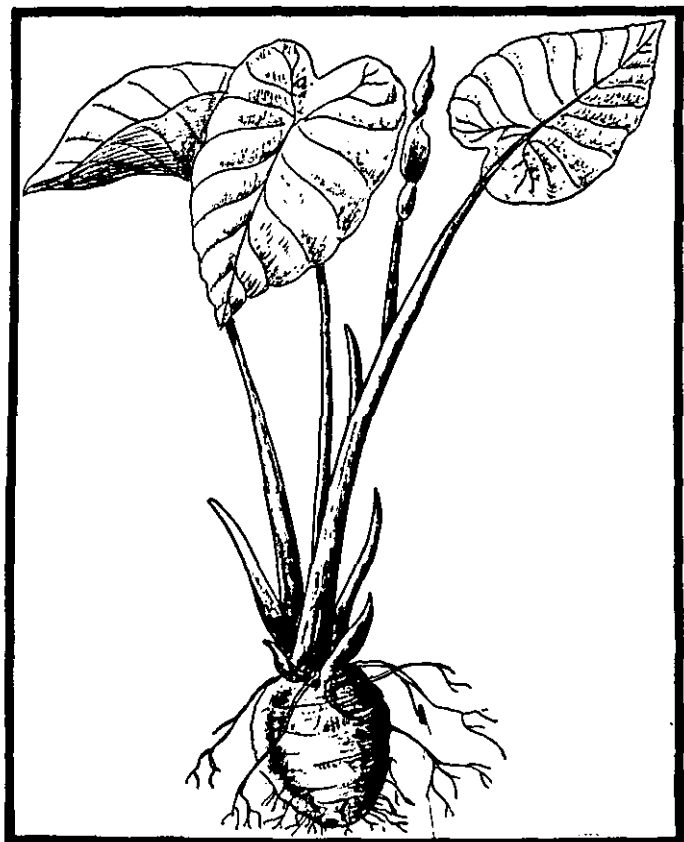


Figure 31. Taro (Badu in Central America). The taro, or badu is widely cultivated in Oceania and Malaysia and is also cultivated in Central America. It is grown in swampy and, less commonly, in upland areas. The plant is 2 to 3 feet high, and has leaves closely resembling those of the larger, and inedible "elephant ears" which are grown as ornamental plants in the United States as well as in the tropics. Taro has thick hairy tubers somewhat larger than potatoes. The tubers, as well as the young leaves, are edible, but all must be thoroughly cooked, preferably by boiling. "Poi," a staple food in many parts of the Pacific, is made by pounding and kneading the peeled boiled tuber, adding water and allowing the resulting paste to ferment slightly. It is very palatable to those who become accustomed to it.



Figure 32. Water chestnut (*Fruita de Mono* in Spanish). A small or medium-sized tree growing in wet forests or swamps in tropical America. Only a few branches grow out from the trunk. The shiny green leaves have 5 to 7 narrow leaflets, usually pointed at the tip. The large flowers are a pinkish color. The fruit is reddish brown and about 8 to 10 inches long. It is very hard and heavy, and the brown seeds are imbedded in solid white flesh. The large seeds are eaten raw, or roasted and eaten like chestnuts.

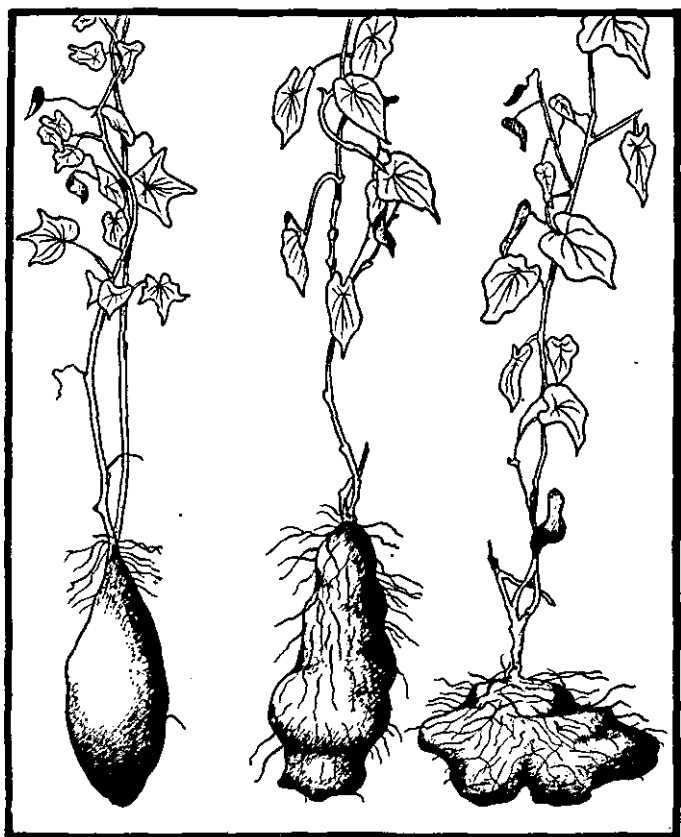


Figure 33. Yam. A plant found in both a wild and cultivated state throughout the south Pacific and in tropical America. The stems are long, usually twining, reddish-green in color, and have numerous small flowers. The tuber resembles the sweet potato, but is usually larger, sometimes weighing as much as 40 pounds. The skin is rough and brown; the meat white to purplish. One variety of yam, with a leaf made up of 3 leaflets with somewhat spiny stems, is poisonous unless properly prepared, and should be avoided. The edible varieties have either a single leaf, or a leaf made up of 5 leaflets. Yams must be cooked before eating, either boiled or roasted in the same manner as a sweet potato.

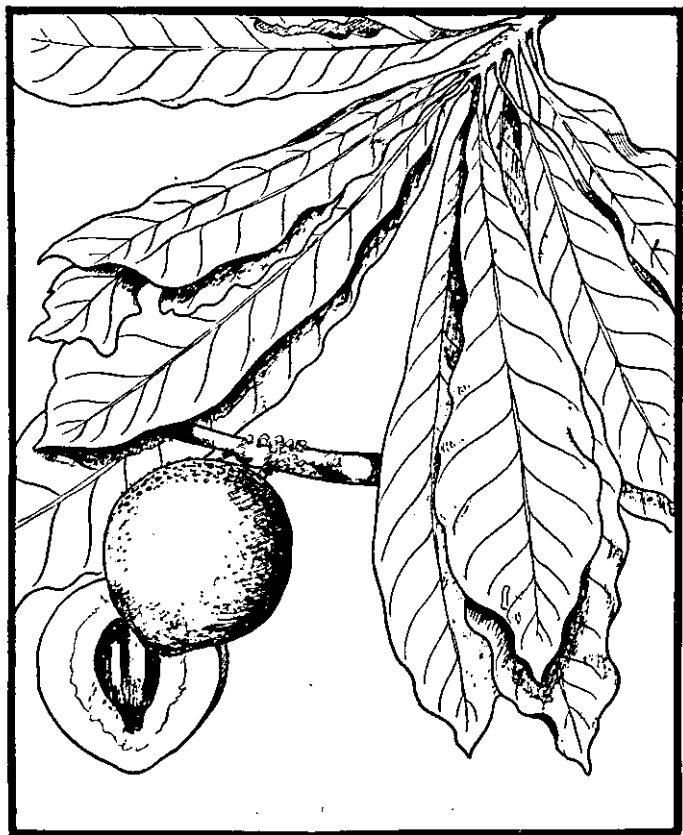


Figure 34. Zapote. A large tree of tropical America sometimes growing to a height of 100 feet. The leaves, pale green on top and paler underneath, are 6 to 12 inches long. The fruit is ball-shaped, 4 to 8 inches in diameter, with rough, brownish skin and pink or reddish meat in which are several large shiny brown seeds. It is usually eaten raw, but may be eaten cooked.

USE OF JUNGLE MACHETE

1. General

A machete is the most effective tool for cutting through jungle. In combat, it is an effective weapon for attacking at night when silence is imperative, and firing impracticable; for killing guards and sleeping enemies; and for defense against attack when firing and reloading weapons or throwing hand grenades is impracticable. The machete is a cutting instrument that depends on velocity, rather than upon weight, for its effectiveness. Maximum velocity and resulting efficiency are obtained by slashing with plenty of whip in the blade, as described in paragraphs 4 to 6.

2. Carrying

The machete is best carried in its sheath, hung on the cartridge belt under the third pocket on the left side. When hung in this position, the edge of the blade is forward, and can be drawn easily without danger of the blade's cutting the legs or body. To prevent possible loss or injury, always make a practice of *sheathing the machete when not using it*.

3. Handling

A machete should never be used with the hand tightly grasping the handle as if it were a heavy hatchet. By using plenty of wrist and finger movement, and by not swinging with the whole arm and shoulder, a man is able to cut his way through heavy vegetation with the minimum expenditure of energy.

4. Starting Position

The starting position for a blow with a machete is to hold the handle tightly with only the thumb and first two fingers. (See fig. 35.) The blade should be turned backward toward the forearm. The little finger and third finger should not grip the handle. When striking

with a machete, the fingers and wrist should snap it forward. At the instant the blade strikes home, grasp the handle tightly with the entire hand and all the fingers, in order to be ready to check a false blow or to prevent the machete from slipping.

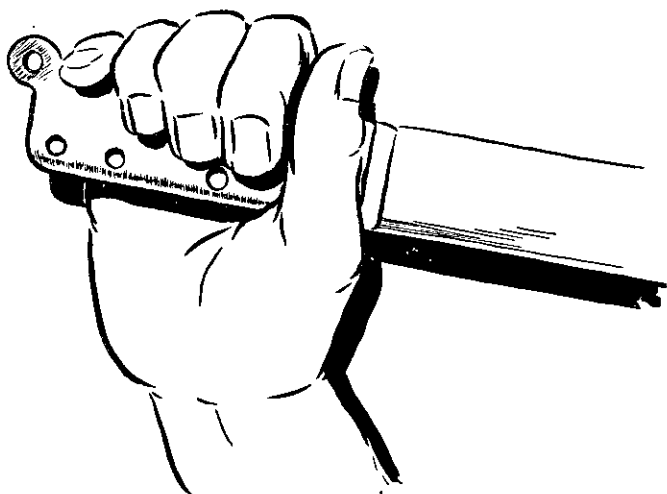


Figure 35. Starting position with machete.

5. Correct Cutting Angle

Always hit vines and limbs at an angle of about 45 degrees to their direction. Never attempt to cut anything, whether it be a vine or a man's arm, directly crosswise. When cutting a new jungle trail, always look ahead to pick out a route and avoid unnecessarily difficult plants and vines.

6. Practice

Proficiency in handling a machete can only be won by practical work in cutting brush and making trails.

7. Cutting Across Jungle

When a patrol is cutting across jungle, off trail, on a compass course, men should be placed in the following order; First, the leading machete man, who cuts as fast as he is

able to in the direction(s) indicated by the group leader. Next, one or two other machete men open up the trail so that those following do not have to stoop or tear their way through with difficulty. The patrol leader should place himself in the third or fourth position from the front of the column. He should guide the leading machete man on a compass course by selecting his route with care, and looking ahead while constantly observing his compass. The patrol leader should indicate the correct course to the leading machete man, either by pointing or by quietly telling him the number of degrees he should move to the right or left. There should always be five or more yards between adjacent men, whether in movement or at a halt. Since heat prostration is one of the most common causes of casualties during hard jungle marches, leaders should give the men a five-minute rest every 30 or 40 minutes. The leading machete man sets the pace, and must work the hardest; the patrol leader should therefore replace him with a fresh man every 15 or 20 minutes.

8. Sharpening

a. A newly issued machete has a rather dull and thick edge. After being sharpened a little, this edge is suitable for cutting hard wood, or for clearing land when there is likelihood of striking rocks that will damage a thin-ground blade. For cutting across tropical jungle, however, a machete blade should have a thin, tapered knife-edge; it should come to a gradual point. (See fig. 36.) The blade should be sharpened, as soon as possible after issue, on a *whetstone* or a *water-cooled* natural-stone grindstone that will not overheat the steel.

b. To sharpen a machete with a small hand whetstone, bury the whetstone halfway in a notch cut in a log or board, thus preventing the stone from slipping. Hold the machete with one hand grasping the handle, with the fingers of the other pressing down on the upturned side of the blade. Rotate the blade on the whetstone. To grind an evenly tapered, sharp edge, be sure to keep the blade at a constant and very small angle with the whet-

stone. In order to avoid the possibility of cutting fingers if the hand slips forward off the handle, do not sharpen the four inches of the blade nearest the handle.

9. Cautions in the use and care of machetes

- a. Sharpen the machete whenever practicable.
- b. Oil the machete to prevent rusting. A thick vaseline or grease is best.
- c. Leave a machete handle smooth, as issued. Do not wrap it with adhesive tape or cord. Do not cut grooves in it. When in use, the machete handle will slip thousands of times in the hand during a single day, and any roughness will tend to blister the hand.

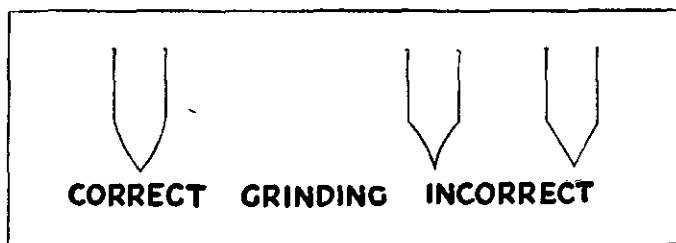


Figure 36. Point of machete when sharpened.

d. Do not use the free hand to grasp a vine or limb that is to be cut.

e. Avoid striking the blade in the ground. Striking a stone will damage the thin cutting edge of a well-sharpened machete.

f. Sheath a machete when not using it.

g. When carrying a naked machete, turn the edge away from the legs and body.

h. Never cut directly downward toward the feet. Slant all blows to right and left.

i. Be sure that no one is within swinging distance of a machete in use. Keep at a safe distance from other men using their machetes.

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